Experimental and Clinical Studies

PSYCHOSOMATIC MEDICINE

CONTENTS

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PSYCHOSOMATIC MEDICINE

Experimental and Clinical Studies

GENERAL INFORMATION

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Editorial Correspondence Manuscripts submitted for consideration and all correspondence relating to editorial matters should be addressed to Dr. Carl Binger, Editor-in-Chief, 714 Madison Avenue, New York 21, N. Y.

Preparation of Manuscripts Manuscripts should be cleanly typewritten, double spaced with wide margins, and should be packed flat. Promptness of publication can be assured only if the manuscripts are submitted in duplicate.

Bibliographies should follow the form of the *Index Medicus*, and authors are urged to verify personally the accuracy of the references, using only the original sources.

Each article should conclude with a summary of about 250 words, intelligible without reference to the body of the text.

A certain amount of illustrative and tabular material is allowed without charge. Important additional matter of this sort may be allowed at cost, at the discretion of the Editor.

The Editors reserve the right to refuse any manuscript submitted, whether on invitation or otherwise, and to make suggestions regarding modification before publication.

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EDITORIAL NOTE

THE JOURNAL AND THE SOCIETY

PSYCHOSOMATIC MEDICINE was founded with the assistance of the Josiah Macy, Jr., Foundation in 1939 and was sponsored during its first five years of publication by the National Research Council, Division of Anthropology and Psychology, Committee on Problems of Neurotic Behavior.

In 1943 the JOURNAL became the official organ of the American Society for Research in Psychosomatic Problems which was organized in December, 1942 and incorporated in December, 1943. Accordingly in 1944 the National Research Council turned over the sponsorship of the JOURNAL to the Society. In January, 1947, in order to simplify its organization, the Society turned over the publication functions of the JOURNAL to Paul B. Hoeber, Inc., Medical Book Department of Harper & Brothers.

At the same time it was felt desirable to clarify and define the relation of the Society to the JOURNAL. The Council of the Society and the Board of Editors therefore agreed upon the following resolution: "The Council is to appoint an Editor-in-Chief by two-thirds choice of the whole Council, the Editor-in-Chief to be appointed for a period of five years, at which time he is automatically to submit his resignation, to be acted upon by a majority of the whole Council. He can then be re-elected or not. The Editor-in-Chief is to select the staff of Editors, representative of various medical and biological disciplines, who must be ratified by the Council. The policies of the Editorial Board remain its responsibility alone. The Editor-in-Chief can only be removed from office by vote of two-thirds of the whole Council for good and sufficient reasons. Upon his removal a new Editor-in-Chief is to be appointed by Council action. He will then have the privilege of selecting a new Editorial Board."

This policy fulfills two fundamental requirements: It gives the Society a certain amount of editorial supervision of the JOURNAL and yet it retains a complete autonomy of the Editorial Board and the continuity of the Board is retained for consecutive periods of five years duration.

To implement the resolution and permit the Council to exercise its appointive function as defined, the Board of Editors voted to resign as a body. With this issue of PSYCHOSOMATIC MEDICINE the new Board of Editors assumes its duties.

THE RELATIONSHIP BETWEEN BLOOD SUGAR AND LYMPHOCYTE LEVELS IN NORMAL AND PSYCHOTIC SUBJECTS *

HARRY FREEMAN, M.D., AND FRED ELMADJIAN, M.S.

Previous investigations have shown that in patients suffering from mental disorders there is a high incidence of abnormality in various phases of carbohydrate metabolism, notably in the direction of a reduction of the tolerance to ingested glucose (4). It has also been noted that the adrenocortical response to stress is less active in schizophrenic patients than in normal subjects (7). The present study was designed to determine whether the dysfunction in sugar metabolism was related to a depression in adrenal activity.

The subjects included 21 normal persons (19 males and 2 females) who were free from organic disease and 35 male psychotic patients. All tests were made under basal conditions. The carbohydrate tolerance tests were performed by the Exton-Rose technic (3), in which two doses of 50 grams of glucose dissolved in 275 cc. of water are ingested 30 minutes apart. Venous samples are obtained just before each glucose solution is ingested and 30 minutes after the second one. Thus there are three blood samples, taken at 30-minute intervals over a period of an hour. For the determination of adrenocortical activity, simultaneous capillary (ear) samples were obtained for measuring the variation in the absolute lymphocyte levels. The studies of Dougherty and White (1) have indicated that discharge of cortical hormone results in a lymphopenia, while quiescence of the hormonal discharge is accompanied by a rise in the lymphocyte count.

In view of the fact that the blood sugar and the lymphocyte count might be influenced by the nervous tension or the water ingestion incident to the test procedure, a preliminary study was made on 9 normal and 12 psychotic subjects of the effects of a saccharin solution on these two functions. The standard technic for the glucose tolerance test was followed, 2 grains of saccharin dissolved in water being administered as a substitute for the glucose solution, the blood levels being followed for 2.25 hours instead of the usual 60 minutes. The results are seen in figure 1. No significant variation was noted in either the blood sugar or the lymphocyte levels in the normal subjects or the patients. We may conclude, therefore, that the factors of emotional tension or fluid ingestion did not meaningfully affect the results obtained by the procedure.

Figure 2 shows the mean changes in blood sugar and lymphocytes for the two groups of subjects after the ingestion of glucose. In the normal individuals there is the characteristic change in blood sugar, a rise during the first 30 minutes and a flattening of the trend in the next 30 minutes. In the patients

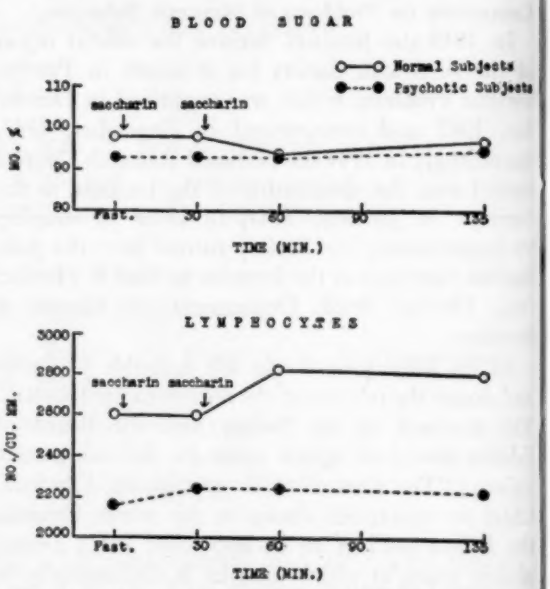


FIG. 1. Means of blood sugar and lymphocyte counts after the administration of two doses of saccharin 30 minutes apart in 9 normal and 12 psychotic subjects.

the mean rise for the first 30 minutes is somewhat greater and there is a further increase in blood sugar during the second 30 minutes.

The absolute lymphocyte count shows a tendency inverse to that of the blood sugar. In the normal subjects there is a sharp fall in the count in the first half hour and a leveling off at this point in the second 30 minutes. In the patients the trend is similar except that there is a slight fall in the second half hour accompanying the secondary rise in blood sugar. It is of interest, however, that although the mean rise in blood sugar is greater in the patients, the fall in lymphocytes is less.

In view of the fact that there are two types of blood sugar change in both the normal and the

* From the Memorial Foundation for Neuro-Endocrine Research and the Research Service of the Worcester State Hospital, Worcester, Massachusetts.

psychotic groups, the first, in which the blood sugar tends to fall in the second 30 minutes, and the second in which the blood sugar tends to rise in the second half hour, it was decided to separate the subjects on this basis. The results are shown in figure 3.

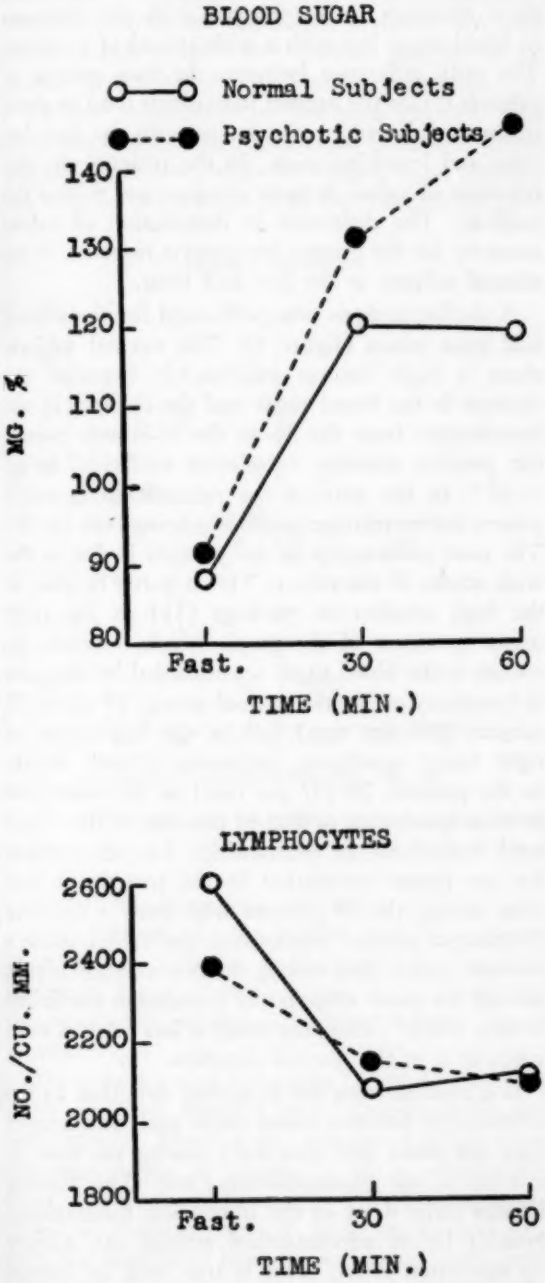


FIG. 2. Mean values of blood sugar and lymphocyte counts during glucose-tolerance tests (Exton-Rose technic) in 21 normal and 35 psychotic subjects.

In the two groups with the downward trend in blood sugar (in the second half hour) the 10 patients show a greater rise in blood sugar than do the 11 normal subjects but the same fall, though from a higher level. The lymphocytes again show a decrease in the first 30 minutes and an increase in the second half hour, mirroring the variation in the blood sugar. However, the fall in lymphocytes is less in the patients than in the normal subjects despite their greater rise in blood sugar. The secondary rise is also slightly less, even though the blood-sugar fall in the second 30 minutes is the same in both types of subjects.

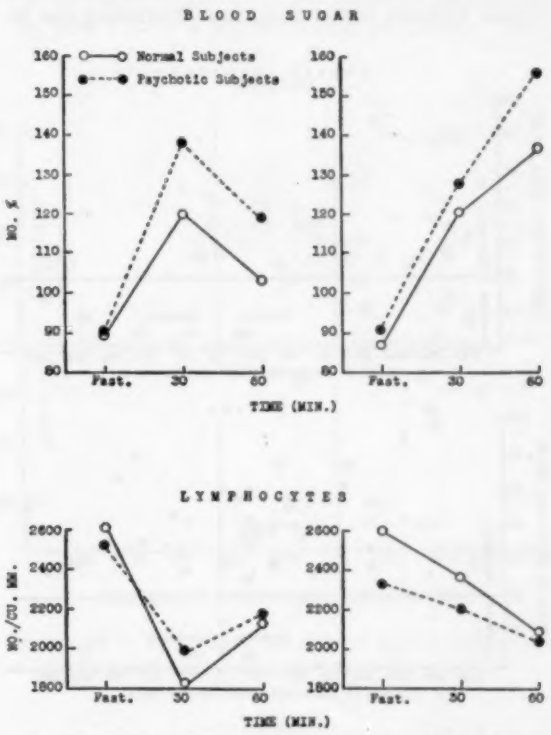


FIG. 3. Mean values of blood sugar and lymphocyte counts during glucose tolerance tests (Exton-Rose technic) in 21 normal and 35 psychotic subjects, divided into 2 groups on the basis of the fall or rise in the blood sugar after the administration of the second dose of glucose.

In the groups with the upward trend in blood sugar (which include 10 of the 21 normals and 25 of the 35 patients), it is of interest that during the first 30 minutes the rise in blood sugar in both groups is almost identical. In the second 30 minutes the patients show a more marked increase in blood sugar. Here the lymphocytes again move in an inverse direction. There is a steady downward tendency in both patients and normal subjects. Again, the patients who show, during the hour, a greater change in blood sugar than the normal subjects exhibit a lesser fall in lymphocytes.

These mean values then demonstrate two facts: 1) the trend in the absolute lymphocyte counts is opposite to that in the blood sugar; 2) the patients show lesser changes in the lymphocyte count than do the normal subjects despite the fact that the blood-sugar increases are greater in the former group.

Further analysis of the data has been undertaken in an attempt to uncover the factors determining the lesser lymphopenic reaction of the patients. Figure 4 shows scatter diagrams illustrating the relationship between the changes in the blood sugar from the fasting to the 30-minute reading with the corresponding changes in the lymphocyte levels in each individual. Because of the varying trends, changes in the lymphocytes are noted on either side of the vertical line and changes in the blood sugar on either side of the horizontal line. For example, the circles in the left upper quadrant represent the values in individuals who have shown in the first half hour an increase in blood sugar and a decrease in lymphocytes. The right upper quadrant contains values representing an increase in blood sugar and an increase in lymphocytes.

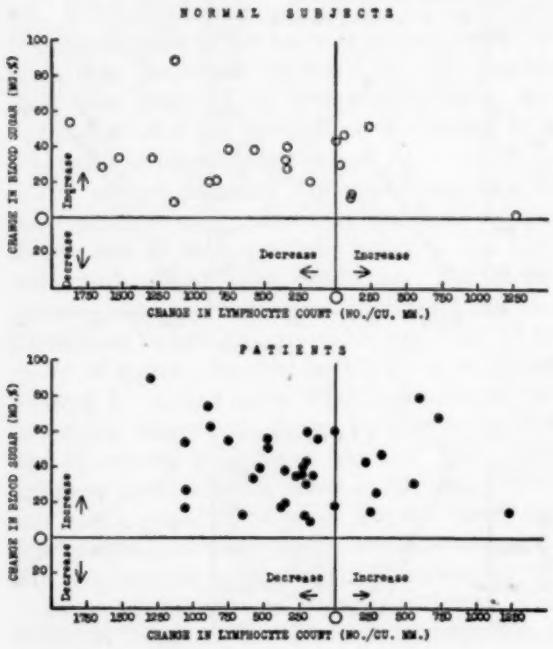


FIG. 4. Scatter diagrams illustrating the relationship between the changes in the levels of blood sugar and of lymphocytes during the first half hour of the glucose-tolerance test (Exton-Rose technic).

The scatter in both normal and patient subjects is surprisingly random in view of the striking inverse trends seen in figure 3. There is, in the individual subject, no quantitative relationship between the changes in either factor with the other. The majority of subjects, both normal and psychotic, show decreases in lymphocytes with the increases in blood sugar but with a wide spread of response. The only difference between the two groups of subjects is that the normal individuals tend to show in some instances greater decreases in the lymphocytes and lesser increases. In the patients the distribution of values is more compact and nearer the midline. The difference in distribution of values accounts for the greater lymphocyte response of the normal subjects in the first half hour.

A similar analysis was performed for the second half hour values (figure 5). The normal subjects show a high inverse relationship between the changes in the blood sugar and the changes in the lymphocytes from the 30- to the 60-minute points, the product moment correlation coefficient being $-.85$.[1] In the patients the relationship is much poorer, the correlation co-efficient being only $-.29$.[2] The poor relationship in the patients is due to the wide scatter of the values. This is partly because of the high number of readings (11) in the right upper quadrant of the graph which indicates increases in the blood sugar accompanied by increases in lymphocytes. In the normal group, 19 of the 21 subjects (90 per cent) fall in the left upper or right lower quadrants, indicating inverse trends. In the patients, 20 (57 per cent) of the values are in these quadrants, so that 43 per cent of the values tend to diminish the relationship. The other reason for the poorer correlation in the patients is that even among the 20 patients who show a negative lymphocyte-glucose relationship the values show a broader scatter than among the normal individuals, so that for these subjects the correlation coefficient is only $-.37$.[3] Thus, the trend is less marked even when it is in the normal direction.

It is evident from the foregoing data that 1) the relationship between blood sugar and lymphocytes does not come into play fully during the first 30 minutes of the glucose-tolerance test. This finding implies some delay in the interacting mechanisms, possibly before adrenocortical activity can achieve its maximum effect. This is true both in normal subjects and patients, although less lymphocytic change (and therefore less adrenal activity) is shown by the patients. 2) The blood-sugar-lympho-

[1] Significant at the 1 per cent level.

[2] Not significant at the 5 per cent level. The difference between the two r's is significant at the 1 per cent level.

[3] Not significant at the 5 per cent level.

cyte relationship is found to be a highly related mechanism in normal subjects in the second half hour of the test, presumably when the two factors come fully into action. In the patients, however, the relationship on the whole is quite low and seems indicative of lesser adrenal activity in response to the stimulus of glucose absorption.

Further examination of the data indicates that the patients fall into two groups. The first group (20 or 57 per cent) show an inverse trend between the two factors like that in the normal subjects. Quantitatively, also, they respond as well as do the normal subjects. In the normal individuals there is an average variation of 21 lymphocytes for each change of 1 mg. of blood sugar; in the 20 patients the relationship is also 21 lymphocytes per mg. of glucose.

The second group of patients (15 or 43 per cent) differ in their reaction both quantitatively and qualitatively. The average variation in lymphocytes per mg. change in glucose is 12, a substantially lesser effect. In addition, the lymphocyte-glucose relationship is not negative, as in the normal subjects, but positive or random, so that the lymphocyte values follow the same direction as the sugar levels. In this group, then, the reactivity of the patients is not only more sluggish than that of the normal subjects but of a different nature.

Since there seems to be a dichotomy in the two groups of patients on the basis of their physiologic reaction, we have attempted to correlate the psychiatric data with these findings on this basis also. We may call the group with the inverse lymphocyte-glucose relationship "normal" and the group with the positive lymphocyte-glucose relationship "abnormal."

The classification of the patients on the basis of the usual diagnostic criteria is shown in Table 1. There are 20 subjects with a negative or "normal" lymphocyte-glucose relationship and 15 subjects with a positive or "abnormal" trend. With the exception of three cases (in the "normal" group) all the others have a schizophrenic psychosis. There is one finding that stands out from the data—that the majority of schizophrenic patients in the "normal" group (12 or 60 per cent) are classified as "schizophrenia, other types." Since the diagnosis "other types" implies at this institution a relative preservation of affect, its concentration in the "nor-

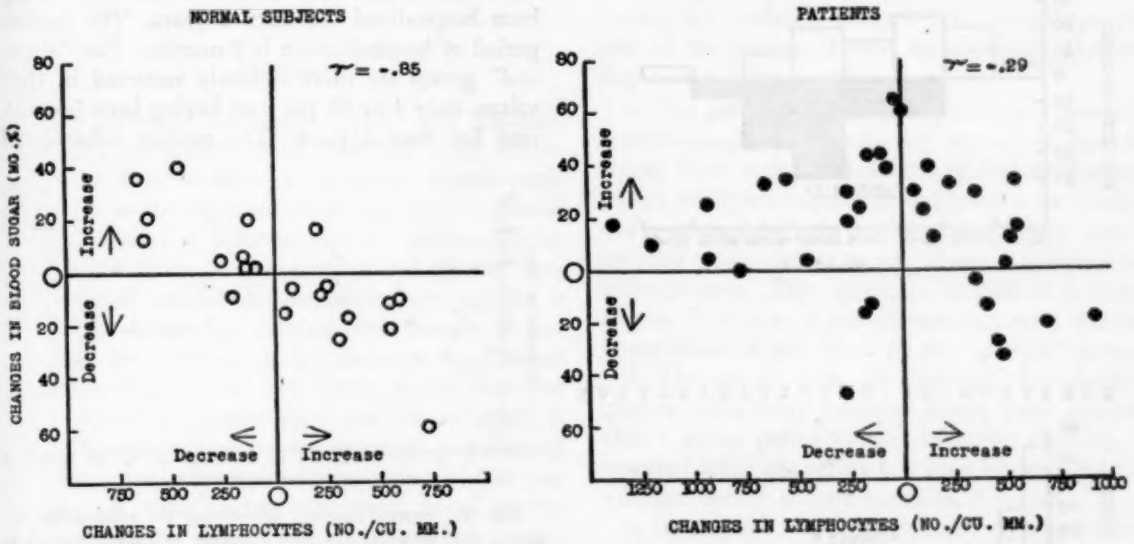


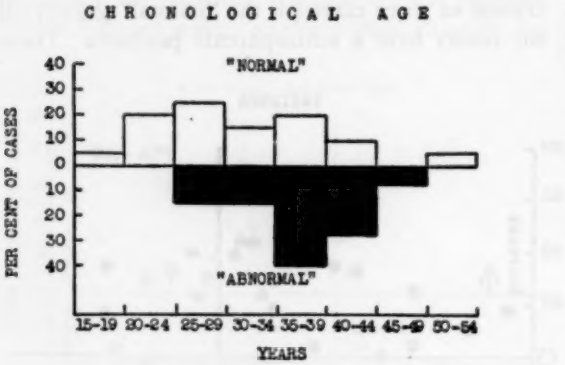
FIG. 5 Scatter diagrams illustrating the relationship between the changes in the levels of blood sugar and of lymphocytes during the second half hour of the glucose tolerance test (Exton-Rose technic).

TABLE I

PSYCHIATRIC CLASSIFICATION OF PATIENTS DIVIDED INTO TWO GROUPS: ONE WITH A NEGATIVE LYMPHOCYTE-GLUCOSE RELATIONSHIP ("NORMAL"), THE OTHER WITH A POSITIVE LYMPHOCYTE-GLUCOSE RELATIONSHIP ("ABNORMAL")

Diagnosis	No. of cases, "normal" group	No. of cases, "abnormal" group
Schizophrenia, paranoid	2	6
Schizophrenia, catatonic	2	1
Schizophrenia, hebephrenic	1	3
Schizophrenia, simple	0	2
Schizophrenia, other types	12	3
Undiagnosed psychosis	2	0
Psychoneurosis, mixed	1	0

mal" group would indicate that these individuals react in a rather appropriate manner to their environmental situation and that their symptomatology is of a more fluid nature. On the other hand, in the "abnormal" group the psychotic syndrome has become more clearly and more rigidly defined. The relative preponderance of paranoid cases in the latter group would tend to confirm this hypothesis.



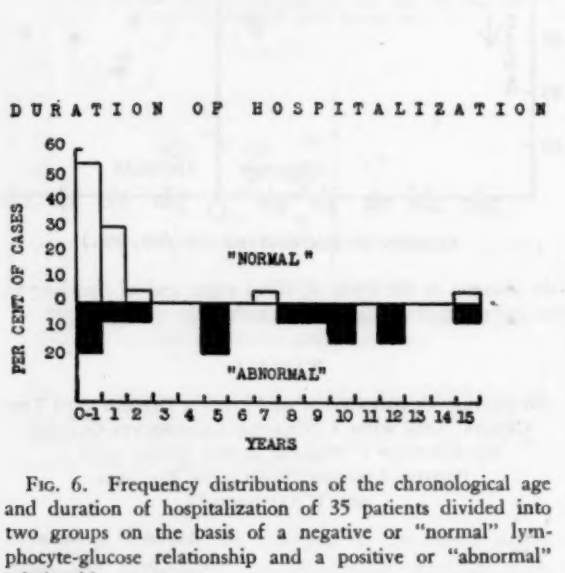


FIG. 6. Frequency distributions of the chronological age and duration of hospitalization of 35 patients divided into two groups on the basis of a negative or "normal" lymphocyte-glucose relationship and a positive or "abnormal" relationship.

Other points of interest arise in a comparison of the two groups of patients on the basis of age and duration of hospitalization. Figure 6 shows the distribution of values in these two categories. The open blocks represent the individuals with "normal" or negative lymphocyte-glucose relationships, while the solid blocks represent the others. In the "normal" group the median age is 30 years with a preponderance of subjects in the third decade of life. In the "abnormal" group the median value is 38 years with the majority of subjects lying in the decade between 35 and 45 years. Thus, the latter group tends to be somewhat older. The control group of subjects, the majority of whom were college students and whose lymphocyte-glucose relationship is similar to that of the "normal" group of patients, has a median age of 23. The problem thus arises whether the difference in the physiologic reaction of the two groups of patients is due to some factor associated with the aging process.

The lower portion of the figure displays a similar type of distribution on the basis of duration of hospitalization. The "normal" group are concentrated chiefly at one end, 17 or 85 per cent having been hospitalized less than 2 years. The median period of hospitalization is 9 months. The "abnormal" group are more diffusely scattered in their values, only 4 or 27 per cent having been hospitalized less than 2 years. The median value is 5.3

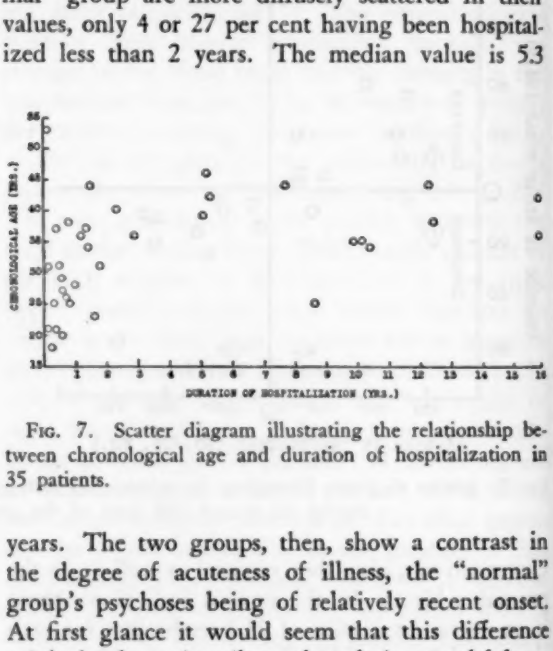


FIG. 7. Scatter diagram illustrating the relationship between chronological age and duration of hospitalization in 35 patients.

years. The two groups, then, show a contrast in the degree of acuteness of illness, the "normal" group's psychoses being of relatively recent onset. At first glance it would seem that this difference might be due primarily to the relative youthfulness of the "normal" group. However, a scatter diagram (figure 7) of the relationship between the chronological age and duration of hospitalization shows no significant relationship, hence the two factors are apparently independent. Considering the degree of overlap of the distributions of the two groups in figure 6, we note a greater differentiation on the basis of duration of hospitalization than on the basis of age, and it would seem probable that duration of illness plays a more important role in differentiating individuals than does age in respect to this specific physiologic reaction.

The implications of a long period of hospitalization in a psychiatric hospital are varied. It indicates, of course, nonrecovery and, to some extent, especially in the schizophrenic psychoses, a tendency toward deterioration. The symptomatology be-

comes more fixed, a fact which may explain the higher incidence of classical syndromes noted previously in the "abnormal" group. On the other hand, the prolonged withdrawal from the stresses of normal living and the enforcement of a relatively simple, regimented existence in the hospital may result in a marked lessening of tension with some effect on the autonomic-endocrine mechanisms of the body. It is impossible in our present state of knowledge to determine whether the "abnormal" reaction is due to factors inherent in the psychosis or in the hospitalization or both.

COMMENT

The results of this study indicate that psychotic subjects, particularly those suffering from schizophrenia, tend to show a "sluggish" lymphopenic reaction to the ingestion of glucose and, in almost half the cases, a different type of relationship between the levels of lymphocytes and glucose than do normal individuals. In other investigations it has been shown that schizophrenic patients do not exhibit the characteristic lymphopenia on exposure to stress that normal individuals do (6, 8). The excretion of 17-ketosteroids is also less active (5, 6, 7). These facts have been interpreted as indicating a less active adrenocortical response in this psychosis. A more recent experiment based on the findings in the present study indicates the connection of the adrenal cortex with the lymphocyte-glucose relationship. Normal rats show a characteristic lymphopenia following the ingestion of glucose. In adrenalectomized rats this lymphopenic response is abolished (2). The results of the present investigation fall in accord with the hypothesis that in this psychosis a high percentage of subjects suffer from an adrenocortical deficiency of a particular type as a result of which certain metabolic mechanisms are brought into play at a subnormal rate or not at all. The relationship between this physiologic characteristic and the existence or maintenance of the psychosis is not, as yet, clear. It is of interest, however, that the differentiation between the "normal" and "abnormal" groups on the basis of duration of hospitalization seems to coincide with the clinical fact that the prognosis is always poorer when the illness has a longer duration than two years. It is a point worth some speculation as to whether the poor prognosis of the more chronic cases is based on the presence of irreversible changes in the physiology, of which the "abnormal" lymphocyte-glucose relationship may be one example.

SUMMARY

A study was made of the blood sugar and lymphocyte levels of 20 normal and 35 psychotic subjects (chiefly schizophrenic) following the ingestion of two doses of 50 Gm. of glucose at 30-minute intervals. It was found:

a. In the normal subjects the blood lymphocytes and blood sugar levels varied inversely, the correlation being −.85 following the second dose of glucose.

b. In the patients the correlation was much poorer, the coefficient being −.29. Forty-three per cent of the patients showed an abnormal relationship of a positive nature.

c. The patients with the negative or "normal" lymphocyte-glucose relationship tended to include chiefly those with an ill-defined type of symptomatology, while in the group with a positive or "abnormal" relationship the psychiatric picture corresponded more clearly to the classical subtypes of schizophrenia. This difference seemed to indicate a more fluid type of symptomatology with greater preservation of the affect in the "normal" group.

d. The group with the "normal" lymphocyte-glucose relationship included chiefly those subjects with a recent period of hospitalization (median, 9 months) while the others had been hospitalized for a longer period of time (median, 5 years).

e. In general, the lymphopenic response to the administration of glucose was less pronounced in the psychotic than in the normal subjects.

It is concluded that the lesser lymphopenia and the positive or "abnormal" lymphocyte-glucose relationship indicate an adreno-cortical failure of a particular type.

We wish to acknowledge the technical assistance of Eleanor Phillips, B.S., and Muriel Ganzburg.

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AMERICAN SOCIETY FOR RESEARCH IN PSYCHOSOMATIC PROBLEMS

PROGRAM ANNOUNCED FOR FIFTH ANNUAL MEETING

The Program Committee of the American Society for Research in Psychosomatic Problems has released the following tentative plans:

The place of the meeting: Chalfonte-Haddon Hall, Atlantic City.

Saturday morning, May 1, 1948, will be given over completely to the reading of short papers. The Committee will welcome any experimental or clinical studies of a psychosomatic nature. A suitable number of papers will be selected which can be read in approximately 15 to 20 minutes each. Others, if acceptable, will be read by title. Manuscripts should be sent, not later than December 1, 1947, to:

Dr. Carl Binger,
Chairman, Program Committee,
714 Madison Avenue,
New York 21, New York.

Saturday afternoon, May 1, 1948, will be devoted to problems in Pediatric Psychiatry. Further announcement will be made about this session.

Saturday evening, May 1, 1948, will be devoted to a round table discussion on Methodology. Attendance at this session will be limited to members only.

Sunday morning, May 2, 1948, will be devoted to considerations on Diabetes.

CHANGES IN THE COUNCIL

Dr. Carl Binger, having been elected Editor-in-Chief of PSYCHOSOMATIC MEDICINE, has resigned as Secretary of the American Society for Research in Psychosomatic Problems and becomes the Journal's representative on the Council of the Society.

Dr. Eugene Ferris has been elected Secretary by the Council of the Society and has accepted the position.

Dr. William Dock has resigned from the Council of the Society.

STUDIES CONCERNING THE ETIOLOGY AND PATHOGENESIS OF NEUROCIRCULATORY ASTHENIA

V. The Introduction of a New Test for the Diagnosis and Assessment of the Syndrome

MEYER FRIEDMAN, M.D.*

INTRODUCTION

Although dyspnea and tachypnea are common manifestations of neurocirculatory asthenia (N.C.A.), it was found in previous studies (3, 4) that they did not stem from any organic defect in the cardiorespiratory system of N.C.A. patients. It was observed in these same studies, too, that when the effort expended by the N.C.A. patient was shorn of emotional content, it was not accompanied by any unusual respiratory difficulties. Finally, it was noted that the N.C.A. patient even at complete bed rest was peculiarly susceptible to inexplicable attacks of tachypnea and dyspnea. Thus, the evidence procured pointed to some essential irritability or stimulation of a center or centers within the central nervous system as the initiating factor in the pathogenesis of N.C.A. respiratory manifestations. An irritability, incidentally, which was not only initiated by emotion but also, apparently, by other unknown and seemingly spontaneous causes.

Despite the fundamental and intrinsic normality of the organs making up the cardiorespiratory system of the N.C.A. patient, errors may be made in its physiologic assessment. This may at times be difficult to avoid when a patient, for example, is encountered who combines both the N.C.A. state and some organic cardiorespiratory defect (7, 8). There exists then a need for a simple, reliable method of detecting and differentiating N.C.A. respiratory difficulties from those due to organic pulmonary or cardiac disease. With this need in mind, a new test was devised and used in a comparative study of normal young adults, N.C.A. patients and patients suffering with intrinsic pulmonary or cardiac disease (with and without concomitant neurocirculatory asthenia).

DESCRIPTION OF THE HYPERVENTILATION TEST

Although it has been noted frequently (6, 9) that the average breath-holding time of N.C.A. patients was less than that of the normal individual, there were such wide variations in a group of N.C.A. patients studied (see Table IIB) that as a single isolated test it was found worthless. In addition, the breath-holding time in organic pulmonary and cardiac disease may be reduced (8), so that this test alone offered no value in differential diagnosis either.

Wood (9) noted that when the N.C.A. patient was asked to overbreathe for any period of time, he usually did not exhibit the involuntary apnea usually observed at this time in the normal individual. This absence of involuntary apnea in the N.C.A. patient after hyperventilation has been confirmed by us. When, however, 20 normal individuals were subjected to this procedure, 7 of them likewise showed no involuntary apnea. For it was observed that any type of external or internal stimulus after such hyperventilation might effect an intake of air even in the normal individual. When this last fact was considered together with the inability to quantitate such a procedure, it was realized that the test itself offered little value as a diagnostic procedure.

When, however, apnea was made a voluntarily maintained function before and after a prescribed period of hyperventilation, a means was found of devising a test which gave some semblance of quantitation and standardization. This test, which we have designated the hyperventilation test, consisted of having the patient hold his breath after a preliminary deep inspiration as long as he was able to do so. The number of seconds he refrained from inspiration was noted and recorded. At the end of this initial breath-holding period, he was allowed to breathe normally for three minutes. The pulse rate was then determined and he was instructed to breathe deeply and rapidly for a period of forty-five seconds during which he took 45 respirations. Immediately at the end of this period of hyperventilation both the pulse rate was determined and the patient was instructed to hold his breath once more as long as he was able to do so. The number of seconds he refrained from breath-

* Director, Harold Brunn Institute for Cardiovascular Research, Mount Zion Hospital, San Francisco, California.

ing was again noted and recorded. A ratio, designated as the hyperventilation index (H.I.), was then obtained by dividing the breath-holding time after hyperventilation (expressed in seconds) by the breath-holding time observed before hyperventilation. Thus if a subject held his breath sixty seconds before hyperventilation and ninety seconds after hyperventilation, his hyperventilation index or H.I. was calculated as 90/60 or 1.50.

The simplicity of the above test obviated any particular precautions other than the insistence upon nasal breathing during the hyperventilation phase of the test. It should be stressed, however, that the patient must be thoroughly instructed to refrain from breathing during each breath-holding phase until it becomes utterly unendurable.

THE RESPONSE OF THE NORMAL INDIVIDUAL TO THE HYPERVENTILATION TEST

Thirty normal young adults whose average age was 26 years were selected for the determination of breath-holding before and after the period of hyperventilation described above. These adults were men who showed no tremor, no excessive perspiration, no evidence of peripheral vasoconstriction, no tachypnea on slight exertion, and who gave no history of nervousness.

It was found (see Table I) that each of the 30 individuals were able to hold their breath considerably longer after hyperventilation than before. Thus, the average breath-holding time before hyperventilation was fifty-eight seconds (range: thirty-five to one hundred seconds) and ninety-two seconds (range: fifty to one hundred and eighty seconds) after hyperventilation. The average hyperventilation index (H.I.) accordingly was found to be 1.58 (range: 1.30 to 2.13). As expected (1, 9) then, hyperventilation, under the conditions of the test established, enabled the normal adult to gain in his ability to hold his breath. The same test was given later to 122 unselected but apparently normal combat veterans and the average H.I. of this group was found to be 1.59, approximately the same as the index found in the 30 selected controls above.

Although it can be seen (Table I) that the H.I. varied considerably in the series of normal adults, it was nevertheless always 1.30 or higher. It was also found when 20 of these same normal subjects were given the test on five successive days that the H.I. of any one individual did not vary more than 0.20 from the initial index obtained. Thus, although the H.I. might vary from 1.30 to 2.13 in a group of normal individuals, it varied much less in the same individual on repeated tests.

Eight of the 30 subjects complained of very slight and transitory giddiness during hyperventilation. Four exhibited slight palmar perspiration following hyperventilation. Almost all of the control subjects described a peculiar type of discomfort, described by several as a feeling of panic, which occurred during the first fifteen to twenty seconds of breath-holding after the hyperventilation phase and tended to make them desire to take a breath. However, this sensation invariably disappeared after about thirty seconds of continued breath-holding, to give way to a feeling of relative comfort during their continued and voluntarily maintained apnea.

The pulse rate (see Table I) in general was found to increase (average increase: 16 per cent) after hyperventilation but this was not an invariable finding.

THE RESPONSE OF THE N.C.A. PATIENT TO THE HYPERVENTILATION TEST

Although 54 of the 60 N.C.A. patients studied reported that they became breathless on moderate exertion, only 34 of them (57 per cent) were actually, on observation, tachypneic and dyspneic during the performance of slight exercise. These 34 N.C.A. patients together with 5 N.C.A. patients who never experienced easily induced dyspnea were given the hyperventilation test.

A. *The Response of the Non-Dyspneic N.C.A. Patient to the Hyperventilation Test*

As Table IIA indicates, the 5 nondyspneic N.C.A. patients were able to hold their breath for a normal amount of time (average: sixty-one seconds) and showed a normal increase in this same ability after hyperventilation. The average H.I. obtained was 1.50 (Range: 1.18 to 1.74), which approached that observed in the group of normal adults studied.

B. *The Response of the Severely Dyspneic N.C.A. Patient to the Hyperventilation Test*

When the 34 N.C.A. patients with easily induced dyspnea were given the test, it was found (see Table IIB) that the average duration of initial breath-holding was forty-three seconds and thus significantly lower than that of the control group. Twenty-five of the 34 patients, however, showed individual values falling within the normal range. Likewise, the average breath-holding time of these patients after hyperventilation was much lower (thirty-eight seconds) than that of the control series, although 6 of the 34 patients had individual values within the range of those found in the nor-

mal adults. These findings indicated quite conclusively that the ability to hold one's breath was not alone a good test in the diagnosis or assessment of the N.C.A. patient.

However, the H.I. was found to be significantly and consistently lower than the lowest observed value of the normal adults, for 33 of the 34 N.C.A. patients (97 per cent) were found to have an H.I. less than 1.30. Also, the average H.I. of the entire group was not only markedly low (0.90) but 18 of the 34 N.C.A. patients (53 per cent) exhibited an H.I. below 1.0. It seemed clear from these observations that the severely dyspneic N.C.A. patients not only showed lesser gains in breath-holding after hyperventilation than the control subjects but, more strangely, were unable in many instances to hold their breath as long after hyperventilation as they were able to do before hyperventilation. It was found, too, that the H.I. of each N.C.A. patient bore a direct relation to his clinical state, in that the smaller the H.I., the more severely ill the patient appeared.

The response of the severely dyspneic N.C.A. patient to the hyperventilation test was not only unusual in regard to the changes in breath-holding time but also in the appearance of other phenomena previously described (4) as occurring after hyperventilation in many N.C.A. patients. In the great majority of the N.C.A. patients (see Table IIB), an increase in hand tremor and the appearance of marked giddiness, peripheral vasoconstriction (cold hands), and axillary-palmar perspiration were observed after hyperventilation or during it. Finally, the pulse rate of all severely dyspneic N.C.A. patients was found to increase markedly following the hyperventilation phase (average increase: 47 per cent). It appeared then that hyperventilation not only produced an abnormal change in the severely dyspneic N.C.A. patient's ability to hold his breath but also produced a number of symptoms and signs

TABLE I

THE RESPONSE OF THE NORMAL INDIVIDUAL TO THE HYPERVENTILATION TEST

Case	Before hyperventilation: Breath-holding (Sec.)	Before hyperventilation: Pulse rate (Min.)	After hyperventilation: Breath-holding (Sec.)	After hyperventilation: Pulse rate (Min.)	Misc. reactions	H.I.	Pulse increase (Per cent)
N-1	48	84	83	92	None	1.73	9
N-2	100	82	180	86	Sl. giddiness	1.80	5
N-3	74	82	100	86	None	1.34	5
N-4	60	80	95	86	None	1.58	8
N-5	40	—	75	—	Sl. giddiness & persp.	1.88	—
N-6	75	—	100	—	None	1.33	—
N-7	65	84	124	84	Sl. persp.	1.90	0
N-8	65	76	105	86	Sl. giddiness	1.62	13
N-9	56	84	103	94	None	1.84	12
N-10	67	80	95	100	None	1.41	25
N-11	58	72	82	102	Sl. giddiness	1.42	42
N-12	62	66	90	78	None	1.46	18
N-13	42	90	65	96	None	1.54	6
N-14	65	90	105	96	None	1.62	6
N-15	50	108	65	120	Sl. giddiness	1.30	11
N-16	68	102	115	116	None	1.69	4
N-17	35	112	50	144	None	1.43	28
N-18	43	96	70	96	None	1.62	0
N-19	70	92	108	144	Sl. giddiness & persp.	1.54	56
N-20	75	112	97	132	None	1.30	16
N-21	62	76	102	102	None	1.68	37
N-22	62	72	90	72	None	1.45	0
N-23	47	96	83	108	None	1.77	11
N-24	40	84	60	96	None	1.50	12
N-25	60	90	97	120	None	1.62	33
N-26	55	96	78	108	None	1.42	14
N-27	50	102	85	104	None	1.70	2
N-28	46	92	98	102	Sl. giddiness	2.13	11
N-29	40	96	56	156	Sl. giddiness & persp.	1.39	63
N-30	73	88	97	92	None	1.33	4
Average	58	89	92	104		1.58 *	16

* Standard Error of Mean = ± 3.65.

TABLE II

THE RESPONSE OF THE N. C. A. PATIENT TO THE HYPERVENTILATION TEST

Case	Before hyperventilation: Breath-holding (Sec.)	Before hyperventilation: Pulse (Min.)	After hyperventilation: Breath-holding (Sec.)	After hyperventilation: Pulse (Min.)	Miscellaneous reactions	H.I.	Pulse increase (Per cent)
			A. N. C. A. patients without dyspnea				
4	70	—	95	—	Giddiness, perspiration	1.36	—
6	95	—	140	—	None	1.47	—
10	40	—	70	—	None	1.74	—
52	55	—	65	—	Giddiness, cold hands, tremor	1.18	—
54	46	—	80	—	Giddiness, cold hands, tremor	1.74	—
Average	61	—	90	—		1.50	—
			B. N. C. A. patients with severe dyspnea				
3	30	—	26	—	Giddiness, cold hands, tremor	0.87	—
7	30	—	34	—	Giddiness, colds hands, tremor	1.13	—
11	25	—	19	—	Giddiness, cold hands, tremor	0.77	—
13	53	—	55	—	Giddiness, cold hands, tremor	1.04	—
16	44	—	50	—	Giddiness, cold hands, tremor, persp.	1.14	—
17	20	—	25	—	Giddiness, cold hands, tremor	1.25	—
18	25	—	20	—	Giddiness, cold hands, tremor, persp.	0.80	—
19	53	—	33	—	Giddiness, cold hands, tremor, persp.	0.62	—
20	50	—	40	—	Giddiness, cold hands, tremor, persp.	0.80	—
26	38	—	32	—	Giddiness, cold hands, tremor, persp.	0.84	—
30	40	—	15	—	Giddiness, cold hands, tremor, persp.	0.38	—
31	35	—	35	—	Giddiness, cold hands, tremor, persp.	1.00	—
32	30	—	25	—	Giddiness, cold hands, tremor, persp.	0.83	—
34	35	—	35	—	None	1.00	—
35	37	—	30	—	Giddiness, cold hands, tremor, persp.	0.81	—
39	42	—	45	—	Giddiness, cold hands, tremor, persp.	1.07	—
41	32	—	32	—	Giddiness	1.00	—
43	72	—	47	—	None	0.66	—
45	40	—	45	—	Giddiness, cold hands, tremor, persp.	1.12	—
48	60	82	55	168	Giddiness, cold hands, tremor, persp.	0.93	105
49	42	114	36	156	Giddiness, cold hands, tremor, persp.	0.86	38
53	53	80	30	110	Giddiness, cold hands, tremor, persp.	0.57	38
55	35	92	28	156	Giddiness, cold hands, tremor, persp.	0.80	70
56	45	110	60	132	Giddiness, cold hands, tremor, persp.	1.33	20
57	46	84	46	120	Giddiness, cold hands, tremor, persp.	1.00	43
58	50	88	20	108	Giddiness, cold hands, tremor, persp.	0.40	23
66	30	108	33	144	None	1.10	34
67	64	120	70	180	Giddiness, cold hands, tremor, persp.	1.09	50
68	45	72	45	144	Giddiness, cold hands, tremor, persp.	1.00	100
69	75	96	75	132	Giddiness, cold hands, tremor, persp.	1.00	38
70	50	90	35	120	Giddiness, cold hands, tremor, persp.	0.70	33
74	37	82	40	108	Giddiness, cold hands, tremor, persp.	1.08	32
75	27	108	24	168	Giddiness, cold hands, tremor, persp.	0.89	56
76	58	80	45	108	Giddiness, cold hands, tremor, persp.	0.90	35
Average	43	94	38	137		0.90	47

which were not found frequently in the normal individual.

THE RESPONSE OF THE PATIENT WITH INTRINSIC CARDIAC DISEASE TO THE HYPERVENTILATION TEST

A. *The Response of the Patient with Intrinsic Cardiac Disease Alone*

Ten young adults who suffered from dyspnea and palpitation on moderate exertion and who showed, on clinical or electrocardiographic examination, evidence of organic heart disease were subjected to the hyperventilation test. None of the 10 patients exhibited manifestations of neurocirculatory asthenia nor did they exhibit signs of acute congestive failure.

It was found (see Table IIIA) that each of the 10 patients gained normally in breath-holding after hyperventilation. Although the average duration of breath-holding both before and after hyperventilation was less than that found in the average normal individual, their average H.I. was found to be 1.57 (range: 1.30 to 2.0), a value approximately the same as that found in the normal individuals. In other words, the young cardiac patient was found to be able to gain in breath-holding proportionately as much as the normal individual although the absolute values were somewhat less in the former. Unfortunately there was no opportunity to examine cardiac patients who were in acute pulmonic or systemic congestive failure, so that the H.I. obtained under such conditions could not be determined.

B. *The Response of the Patient with Organic Heart Disease and Neurocirculatory Asthenia*

Seven young adults who suffered from organic heart disease but who also showed unmistakable signs of neurocirculatory asthenia (hand tremor, excessive axillary-palmar perspiration, transient precordial pain of the sharp variety, giddiness, intermittent N.C.A. hyperthermia (2), and frequent episodes of peripheral vasoconstriction) were given the hyperventilation test.

It was found (see Table IIIB), in marked contrast to those patients having only organic heart disease, that the average initial breath-holding time (thirty-nine seconds) was greater than that (thirty-six seconds) attained after hyperventilation. Thus the average H.I. was found to be 0.90 (range: 0.73 to 1.0). It was observed then that whereas organic heart disease alone did not alter the H.I. of an individual, neurocirculatory asthenia either alone or in conjunction with heart disease frequently resulted in the finding of a low H.I. in the individual thus involved.

THE RESPONSE OF THE PATIENT WITH INTRINSIC PULMONARY DISEASE TO THE HYPERVENTILATION TEST

A. *The Response of the Patient with Pulmonary Disease Alone*

Twenty patients suffering either from (a) traumatic pneumothorax or hemopneumothorax (5 patients), (b) advanced pulmonary tuberculosis (5 patients), and (c) allergic asthma (10 patients) were given the hyperventilation test.

It was found (see Table IIIC,D,E) that although the breath-holding times both before and after hyperventilation were reduced in most of these patients, the relative gain in breath-holding after hyperventilation was approximately the same as that found in the group of normal individuals. For this reason, the H.I. of these patients was found to vary within the limits of normal, averaging 1.57 in the group of patients with pneumothorax or hemopneumothorax, 1.50 in those suffering from pulmonary tuberculosis, and 1.57 in those suffering from allergic asthma.

B. *The Response of the Patient with Pulmonary Disease and Neurocirculatory Asthenia to the Hyperventilation Test*

Five patients suffering from bronchial asthma not clearly of an allergic nature and also presenting the clear-cut manifestations of neurocirculatory asthenia, as described above, were given the hyperventilation test. It was found that not only were the breath-holding times before and after hyperventilation reduced below the normal standards but also that each of the 5 patients failed to gain in breath-holding after hyperventilation. The average H.I. of this group was found to be 0.71 (range: 0.50 to 0.87). These findings made it clear that whereas pulmonary disease alone did not lead to an abnormally low H.I., neurocirculatory asthenia when added to intrinsic lung disease was capable of effecting a low H.I. in the patient so affected.

STUDIES CONCERNING THE CAUSE FOR THE LOW HYPERVENTILATION INDEX IN THE SEVERELY DYSPNEIC N.C.A. PATIENT

Although the low H.I. found in the severely dyspneic N.C.A. patient or in the patient with combined neurocirculatory asthenia and organic cardiorespiratory disease was an incontestable and

TABLE III

THE RESPONSE OF THE PATIENT WITH AN INTRINSIC CARDIAC OR PULMONARY DISORDER TO THE HYPERVENTILATION TEST

Case	Type of disorder	Before hyperventilation: Breath-holding (Sec.)	After hyperventilation: Breath-holding (Sec.)	Miscellaneous reactions	H.I.
	A. Patients with Organic Heart Disease				
H-1	Aortic-mitral insuff.	60	80	None	1.46
H-2	Mitral stenosis-insuff.	45	90	Sl. giddiness	2.00
H-3	Mitral stenosis-insuff.	70	95	None	1.35
H-4	Mitral stenosis-insuff.	43	56	None	1.30
H-5	Mitral stenosis-insuff.	50	85	None	1.70
H-6	Mitral stenosis-insuff.	48	78	None	1.62
H-7	Aortic-insuff.	40	70	None	1.75
H-8	Arterioscl. heart disease	45	70	None	1.57
H-9	Arterioscl. heart disease	35	47	None	1.35
H-10	Mitral insuff.	55	88	None	1.60
Average		49	76		1.57
	B. Patients with Organic Heart Disease and Neurocirculatory Asthenia				
HN-1	Mitral stenosis-insuff.	30	30	Giddiness, tremor, persp.	1.00
HN-2	Mitral stenosis-insuff.	28	23	Giddiness, tremor, persp.	.82
HN-3	Mitral stenosis-insuff.	40	29	Giddiness, tremor, persp.	.73
HN-4	Mitral stenosis-insuff.	50	48	Giddiness, tremor, persp.	.96
HN-5	Mitral stenosis-insuff.	44	40	Giddiness, tremor, persp., cold hands	.91
HN-6	Aortic insuff.	40	38	Giddiness, tremor, persp., cold hands	.90
HN-7	Aortic stenosis	44	44	Tremor	1.00
Average		39	36		.90
	C. Patients with Pneumothorax or Hemopneumothorax				
P-1	Spont. pneumothorax	40	70	None	1.75
P-2	Traumatic hemothorax	37	60	Sl. giddiness	1.62
P-3	Traumatic hemopneumothorax	28	38	None	1.36
P-4	Traumatic hemopneumothorax	28	40	None	1.43
P-5	Spont. pneumothorax	26	44	None	1.69
Average		32	50		1.57
	D. Patients with Advanced Bilateral Pulmonary Tuberculosis				
T-1	Chronic-cavitation	34	52	None	1.53
T-2	Chronic-cavitation	35	45	None	1.28
T-3	Chronic-cavitation, pneumothorax	30	55	None	1.83
T-4	Chronic-cavitation, pneumothorax	28	40	Sl. giddiness	1.42
T-5	Chronic-cavitation, pneumothorax	26	38	None	1.46
Average		31	46		1.50
	E. Patients with Allergic Asthma				
A-1	Persistent rales	64	125	None	1.96
A-2	Persistent rales	50	65	Sl. giddiness	1.30
A-3	Persistent rales	30	50	None	1.66
A-4	Persistent rales	42	72	Sl. giddiness	1.72
A-5	No rales at test	50	74	None	1.48
A-6	Persistent rales	60	80	None	1.33
A-7	Persistent rales	30	50	None	1.66
A-8	Persistent rales	32	54	None	1.68
A-9	Persistent rales	38	60	None	1.58
A-10	Persistent rales	40	55	None	1.37
Average		44	69		1.57
	F. Patients with Asthma and Neurocirculatory Asthenia				
AN-1	Persistent rales	45	30	Giddiness, tremor, persp.	.66
AN-2	No rales at test	38	33	Giddiness, tremor, persp., cold hands	.87
AN-3	No rales at test	38	25	Giddiness, tremor, persp., cold hands	.66
AN-4	No rales at test	30	15	Giddiness, tremor, persp., cold hands	.50
AN-5	Persistent rales	33	28	Giddiness, tremor, persp., cold hands	.85
Average		37	26		.71

constantly reproducible phenomenon, the causes for it still remained obscure. For this reason, the experiments described below were performed.

A. *The Effect of the Respiration of Pure Oxygen Before and During Hyperventilation on the Hyperventilation Index of the Severely Dyspneic N.C.A. Patient*

Nine N.C.A. patients were given the hyperventilation test as described. The following day they were given the same test except that for two minutes prior to the initial breath-holding phase and all during that of hyperventilation they were allowed to breathe pure oxygen by mask. As Table IV indicates, although there was a possibly significant decrease in the H.I. in Case 59, the average H.I. (0.91) of the group breathing pure oxygen was approximately the same as that (0.92) obtained when this same group had respired ordinary air before and during the phase of hyperventilation. This indicated that possible changes in the utilization or concentration of oxygen in the blood were not concerned in the genesis of a low H.I. after the hyperventilation test.

TABLE IV

THE HYPERVENTILATION INDEX OF THE SEVERELY DYSPNEIC N.C.A. PATIENT AFTER HYPERVENTILATION OF AIR, PURE OXYGEN AND A MIXTURE OF OXYGEN AND CARBON DIOXIDE

Case	H.I. (Air)	H.I. (Oxygen)	H.I. (Oxygen 95%: Carbon dioxide 5%)
59	1.00	.89	1.09
70	.70	.70	1.00
66	.91	.98	.78
69	1.00	1.17	1.00
18	1.00	.98	1.04
73	.90	.97	.80
74	1.08	.98	.98
75	.89	.78	.86
76	.78	.72	.75
Average	.92	.91	.92

B. *The Effect of the Respiration of Oxygen (95 per cent) and Carbon Dioxide (5 per cent) Before and During Hyperventilation on the Hyperventilation Index of the Severely Dyspneic N.C.A. Patient*

When these same 9 N.C.A. patients were allowed to breathe a mixture containing 95 per cent oxygen and 5 per cent carbon dioxide by mask during the hyperventilation phase of the test, the average H.I. (0.92) obtained (see Table IV) was approximately the same as that obtained when these patients respired air or pure oxygen during hyperventilation. This indicated that the inability of the N.C.A. patient to gain significantly from hyperventilation was not due to any peculiar or paradoxical sensitivity to a lowered blood concentration of carbon dioxide occurring after overbreathing.

C. *The Effect of Altering the Rate of Respirations During the Hyperventilation Phase of the Test on the Hyperventilation Index of the Severely Dyspneic N.C.A. Patient*

Since the low H.I. of the severely dyspneic N.C.A. patient appeared to be caused by something other than changes in the blood concentration of oxygen and carbon dioxide at the end of the hyperventilation phase of the test, it was thought possible that the reflex neurogenic stimulation of some center of the central nervous system concerned with respiration might have been responsible for the comparative deficit in breath-holding time observed in the severely dyspneic N.C.A. patient after hyperventilation.

Seven N.C.A. patients and 6 normal adults accordingly were asked to perform the test in the usual manner. They then were instructed to repeat the entire procedure except that during the phase of hyperventilation they were instructed to breathe 80 times instead of the ordinary 45 times during the period of hyperventilation. For it was reasoned that if the low H.I. found in dyspneic N.C.A. patients was due in part to the rapid respirations of the test, which led to a neurogenic stimulation of some center or centers within the central nervous system, then an even greater increase in respiratory rate would be expected to effect an even greater stimulation, hence an even more reduced H.I.

This was found to be true, as inspection of Table V indicates. For the H.I. of all N.C.A. patients decreased after the second test during which the respiratory rate during the hyperventilation phase was increased almost twofold. The H.I. of 5 of the 6 normal individuals, however, either increased or remained the same during the second test. These observations suggested the possibility that the breath-holding time of the severely dyspneic N.C.A. patient was not sufficiently increased after hyperventilation, despite the gaseous changes therein effected, because the neurogenically induced irritation set up in this type of individual by increased respirations nullified in some manner the normally expected increase in breath-holding after hyperventilation.

TABLE V

THE EFFECT OF RATE OF HYPERVENTILATION ON THE SEVERELY DYSPNEIC N.C.A. PATIENT AND THE NORMAL INDIVIDUAL AS JUDGED BY THE HYPERVENTILATION INDEX

Case	H.I. after standard rate of hyperventilation *	H.I. after increased rate of hyperventilation **
	A. Severely Dyspneic N.C.A. Patients	
80	1.0	0.60
66	1.10	0.67
79	0.79	0.39
77	1.13	0.80
74	1.08	0.95
75	0.88	0.55
59	1.00	0.58
Average	0.99	0.65
	B. Normal Individuals	
C-1	1.85	1.73
C-2	1.68	2.10
C-3	1.44	1.56
C-4	1.35	1.40
C-5	1.50	1.50
C-6	1.66	1.64
Average	1.58	1.65

* 45 respirations during the hyperventilation phase of the test.
** 80 respirations during the hyperventilation phase of the test.

DISCUSSION

In the introduction of such a ratio as the hyperventilation index (H.I.) as diagnostic of the N.C.A. state either alone or in combination with intrinsic cardiorespiratory disease, it must be stressed that because of its dependence upon a subjective function considerable variation may be expected not only in a group of individuals but also (although to a much less degree) in the same individual at divers times. Thus it was found that the H.I. varied from 1.30 to 2.13 in the group of normal individuals studied. However, neither in the group nor in the single individual in repeated tests was the H.I. ever observed to be less than 1.30, so that a value below this was considered abnormal.

It was not considered remarkable that those individuals suffering from intrinsic cardiorespiratory disease alone exhibited an H.I. not only above 1.30 but well within the normal range. For, as described above, the H.I. measured the ratio of breath-holding times and was not dependent on the absolute values obtained.

The finding of a low or fractional H.I. in the overwhelming majority of severely dyspneic N.C.A. patients cannot be considered surprising when it is remembered that already it had been observed (9) that these individuals failed to show involuntary apnea after hyperventilation. Several years ago, Herzog (5) also had observed that the breath-holding time of the N.C.A. patient frequently was not benefited by a single deep inspiration, so that the employment of the hyperventilation test and the H.I. obtained from it can only be considered as novel in that it offered some degree of quantitation in the assessment of the paradox observed in the severely dyspneic N.C.A. patient.

The finding of a normal H.I. in patients suffering with organic pulmonary or cardiac disease but without N.C.A. manifestations, and a low H.I. in patients with severe neurocirculatory asthenia alone or in combination with intrinsic cardiorespiratory disease suggested that the utilization of the hyperventilation test might allow the investigator not only the means to detect the presence of the N.C.A. syndrome in an individual but also the presence of this same syndrome when it is in association with some organic disorder of the lung or heart. For the H.I. differs from the Schneider Index quite radically in that its value is determined *solely* by neurogenic or psychogenic factors, thus offering the possibility of differentiating so-called "functional" from "organic" cardiorespiratory disorders. Thus, for example, the employment of the hyperventilation test in the present study indicated without a shred of doubt the essential neurogenic or psychogenic element underlying the dyspnea of the N.C.A. patient. The same conclusions, however, had been reached in earlier studies (3, 4).

It should be emphasized that the hyperventilation test not only affected the breath-holding time of the severely dyspneic N.C.A. patient paradoxically but it also evoked a profound and generalized neurogenic reaction, mostly of sympathetic character, characterized by marked axillary-palmar perspiration, hand tremor, peripheral vasoconstriction (cold hands), marked giddiness, and increased pulse rate. As a matter of fact, the almost invariable appearance of a tachycardia after hyperventilation in these N.C.A. patients gave a somewhat objective control for the test, for it was found that if there were no tachycardia following the overbreathing phase of the test, the H.I. would invariably be within normal range.

After more than two years of close and detailed study of the N.C.A. patient, the author knows of no single test which has proved to be of such benefit as the above described procedure in the routine diagnosis and assessment of the N.C.A. syndrome. It must again be repeated, however, that the test

is not positive in all N.C.A. patients. When a low or fractional H.I. is found in an individual, he will be found to be easily dyspneic on slight exertion. The severity of his N.C.A. syndrome also will be found to be marked.

SUMMARY

An especially designed hyperventilation test preceded and followed by maximal breath-holding was described. By means of the breath-holding values thus obtained, a ratio designated as the hyperventilation index (H.I.) was obtained. The normal range of the H.I. was determined.

When the normal individual and the patient suffering from an intrinsic pulmonary or cardiac disorder (but without neurocirculatory asthenia) were given the hyperventilation test, the range of the H.I. obtained in both types of individuals was approximately the same. When the severely dyspneic N.C.A. patient, however, or the patient suffering from both intrinsic cardiorespiratory disease and the N.C.A. syndrome were studied, the H.I. obtained was invariably abnormally low and usually less than unity.

The test and the index obtained from it were presented not only as a positive diagnostic for the detection of severe neurocirculatory asthenia but also as a method for the assessment and differentiation of the part played by the N.C.A. syndrome in the production of cardiorespiratory symptoms in a patient who suffers from both it and organic cardiorespiratory disease.

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NEW YORK PSYCHOANALYTIC INSTITUTE AND SOCIETY

Announcement has been made by the New York Psychoanalytic Institute and the New York Psychoanalytic Society of their new officers, for the year 1947-1948. The officers for the Institute are:

President:	Dr. Adolph Stern
Vice-President:	Dr. Ruth Loveland
Secretary:	Dr. Otto Isakower
Treasurer:	Dr. Harry I. Weinstock

For the Society the officers are:

President:	Dr. Sandor Lorand
Vice-President:	Dr. William H. Dunn
Secretary:	Dr. John Frosch
Treasurer:	Dr. Harry I. Weinstock

STUDIES CONCERNING THE ETIOLOGY AND PATHOGENESIS OF NEUROCIRCULATORY ASTHENIA

VI. Episodic Neurogenic Discharge as a Manifestation of the Syndrome

MEYER FRIEDMAN, M.D.*

INTRODUCTION

In previous studies (6, 7, 8, 9), the hyperthermia, giddiness, cardiovascular, and respiratory manifestations of neurocirculatory asthenia (N.C.A.) were investigated. Despite careful study and observation, it was impossible to detect any permanent, intrinsically determined defect in any visceral organ to account for the occurrence of these N.C.A. phenomena. Rather, all evidence obtained indicated that the syndrome was primarily one of dysfunction of some portion of the central nervous system and that the hypothalamus was involved in the mediation of the somatic manifestations of the syndrome. In a recent additional study (10), the results of a newly introduced hyperventilation test indicated without question that the severe N.C.A. patient suffered, in certain particulars at least, from a neurogenic dysfunction.

The N.C.A. patient who has been observed for twelve hours a day over a period of weeks frequently presents a phenomenon that may not be detected when examined at a single or even at several brief interviews. This phenomenon is the occurrence during bed-rest of a spontaneous, seemingly causeless exacerbation of his somatic symptoms and signs. These exacerbations or attacks, which we have designated as those of "episodic neurogenic discharge," have been observed to take four rather distinctive types: 1) a predominantly cardiovascular form in which cardiac arrhythmia or simple tachycardia occurred, accompanied by peripheral vasoconstriction, accentuation of hand tremor, and excessive sudation of the skin of palm and axillae; 2) a predominantly respiratory form in which tachypnea and dyspnea first occurred but were rapidly followed by the appearance of cardiac changes, peripheral vasoconstriction, giddiness, accentuation of hand tremor, and excessive palmar and axillary sudation; 3) a predominantly peripheral neurogenic form in which an accentuation of hand tremor, excessive palmar and axillary sudation, and peripheral vasoconstriction occurred; and 4) a cerebral form in which only syncope took place.

The frequency, pathogenesis, and nature of these attacks were studied in 62 N.C.A. patients and the results obtained are contained in this present communication.

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I. THE FREQUENCY OF EPISODIC NEUROGENIC DISCHARGE IN N.C.A. PATIENTS

The 62 hospitalized N.C.A. patients were observed for an average period of twenty-six days. Each of them exhibited the typical manifestations of neurocirculatory asthenia as described in an earlier study (6). The average age of the patients was 24 years.

It was found that 48 of the patients (77 per cent) experienced at some time during their hospital stay an attack of episodic neurogenic discharge. The predominantly cardiovascular type was the most frequently observed one and occurred in 28 patients. Sixteen exhibited the predominantly respiratory type, and 4 patients the predominantly peripheral neurologic type. Although none of the patients spontaneously exhibited the cerebral form, 2 patients gave a history of syncope and in them unconsciousness could be provoked experimentally.

II. PREDISPOSING CAUSES OF EPISODIC NEUROGENIC DISCHARGE

None of the patients had been exercising or working prior to the onset of an attack, nor could any emotional disturbance be detected immediately preceding the discharge. The patients themselves, on close questioning, could give neither physical nor mental causes to explain the onset of an attack. During an attack, most of the patients presented the facial expression of anxiety but they insisted that it was due to the nature and progression of their somatic symptomatology. Certainly it was true that when an attack ceased, the facial expression of apprehension also disappeared.

III. CLINICAL DESCRIPTION OF EPISODIC NEUROGENIC DISCHARGE

A. Predominantly Cardiovascular Type

Typically, the average attack began abruptly. An arrhythmia was observed in 16 of the 28 patients

having a discharge. Nine of these 16 had ventricular extrasystoles; 4 suffered from paroxysmal auricular tachycardia; 2 had electrocardiographic evidence of wandering auricular pacemaker; and one had evidence of paroxysmal auricular flutter. The remaining 12 patients were observed to have regular rhythm but extraordinarily forceful and rapid contraction of the heart.

Besides the cardiac manifestations, the patients also exhibited an accentuation of pre-existing hand tremor, excessive sudation, and cold, moist hands (peripheral vasoconstriction). Six of the 28 patients had oral temperatures above 99.5° F. during their attacks. The majority of them also experienced the sharp type of precordial pain (8).

The duration of this type of discharge varied from several minutes to several hours.

B. Predominantly Respiratory Type

The 16 patients presenting this type of discharge were typical examples of hyperventilation syndrome (11, 17). The attacks began by the patient feeling that he was not obtaining sufficient air. A deep breath or a series of them then would be taken and expired with a sigh, until inspiration and expiration became rapid as well as deep. As soon as the tachypnea developed, acceleration of heart rate occurred (8) and in some cases, ventricular extrasystoles also began. Almost simultaneously with increase in cardiac rate, the hands and feet became cold, wet, and increasingly tremulous. The excessive sudation always began in the axillae and skin of the distal portions of the extremities but if the attack were severe and prolonged, it would involve the entire body. With the continuance and intensification of the attack, air hunger, palpitation, intense giddiness, the sharp type of precordial pain, and tingling of the hands and feet were observed also. Carpopedal spasm was observed in 3 of the 16 patients. The temperature of 5 patients was taken twenty minutes after the onset of attack, and in all 6, it was above 99.2° F.

A gas mixture containing 95 per cent oxygen and 5 per cent carbon dioxide was given to 10 of these patients when they were having this type of discharge. It was found that although the intense giddiness, tingling of the extremities, and carpopedal spasm (2 patients) disappeared, no sudden improvement in the degree of dyspnea, tachypnea, tachycardia, excessive sudation, hand tremor, or peripheral vasoconstriction was observed. These latter manifestations of discharge disappeared so gradually that it did not seem likely that they were much affected by the changes brought about in the blood gases by the administration of the gas mixture. It appeared therefore that the low carbon dioxide content of these patients' blood produced by hyperventilation effected only some of the changes seen in the typical attack. On reflection, this was obvious for it would be difficult to explain the original attack of dyspnea and tachycardia on the basis of a lowered blood content of carbon dioxide if the latter were the result of the attack itself. The psychologic effect of the physician's presence, his admonitions to remain calm and to breathe slowly, and the use of an extrinsic agent such as the gas mixture, might all have been of considerable importance in the gradual subsidence of the dyspnea, tachypnea, and other phenomena not eradicated by the administration of carbon dioxide. In previous studies (9, 10) it was found that when the severe N.C.A. patient was asked to hyperventilate voluntarily he exhibited many of the above manifestations although his blood carbon dioxide content was found to be the same as that of the controls. It appeared then that the original impulse for the pathogenesis of this type of discharge was of psychogenic or neurogenic origin. Most of the manifestations of the discharge also appeared to have this etiology.

C. Predominantly Peripheral Neurogenic Type

Four patients of the entire series were observed to exhibit this type of discharge. It began with an accentuation and progression of a pre-existing tremor of the hands until, at the height of an attack, the entire body was shaking. Concomitantly, excessive axillary and palmar sudation occurred. The hands and feet became intensely cold and usually cyanotic. Duration of this type of attack varied from ten minutes to several hours. No cardiorespiratory dysfunction occurred.

D. Cerebral Type

Few N.C.A. patients actually lose consciousness. The occurrence of extreme dyspnea, fatigue, and giddiness lead to a type of exhaustion which the N.C.A. patient frequently considered as synonymous with fainting but when closely questioned only 2 of the 62 N.C.A. patients of this study actually lost consciousness frequently. Frequent loss of consciousness was found in 3 individuals of a group of 130 N.C.A. patients previously seen. Lewis (12) mentioned fainting as a not infrequent symptom of "effort syndrome." In the present study, none of the N.C.A. patients were observed

to faint spontaneously while hospitalized. It was found, however, that unconsciousness could be produced in the 2 N.C.A. patients who gave a history of frequent fainting. It had been observed also that the 3 N.C.A. patients previously seen who complained of this symptom could be made to lose consciousness. For the purposes of this study, these patients have been included.

The N.C.A. patients who gave a history of frequently losing consciousness insisted that their attacks were never preceded by any aura. During the period of unconsciousness (rarely lasting over sixty seconds), no convulsions, tongue-biting, or loss of sphincter control occurred. None of the patients ever lost consciousness while in the supine position.

It was found that syncope could be produced in these 5 patients by massage of either the right or left carotid sinus. Manipulation of the carotid artery below the sinus produced no discernible effects upon the state of consciousness.

When syncope was induced in these 5 patients by sinus massage, unconsciousness occurred without observable change in either pulse rate or blood pressure. These findings were in agreement with the observations of Weiss and Baker (18) that syncope of the cerebral type without vasovagal changes was most frequently found in individuals having the manifestations of what they called "vegetative neurosis."

The first objective manifestation of a typical attack was the abrupt change in respiration which became deeper, somewhat faster, more thoracic in excursion, and frequently sighing in quality. Mental blurring then occurred, during which the patient could understand and answer very simple questions but became confused when asked to calculate simple arithmetic problems. A few seconds later the eyes became glassy, the face blanched, the jaw dropped, and the patient slumped forward, unconscious. Two of the patients invariably experienced dreams while in this last state.

After consciousness was regained in 3 of these 5 patients it was observed that they became highly emotional without actually having had any discernible cause for an emotional reaction. Two of them shed tears although they insisted that they did not feel sad. The third patient was wont to laugh uproariously after the sinus had been stimulated only long enough to effect some mental dulling. He too could give no adequate explanation for his laughter.

Although it had been pointed out by Weiss and Baker (18) that the production of syncope of the cerebral type was easier to effect if the patient were in the upright position, the reason for this fact was not and has not been explained. Since no observable changes in the systemic or cerebral hemodynamics were found (4) during this type of syncope, and since unconsciousness following postural hypotension (in which there were marked changes in cerebral hemodynamics) gave a radically different electroencephalogram (5) than the former type of syncope, it appeared that a *gross* change in cerebral circulation was not responsible for the unconsciousness occurring in our 5 patients following stimulation of the carotid sinus.

When the effect of posture on the induction of syncope was studied, it was found that the ease with which syncope could be brought about was not dependent upon the posture of the patient's body but upon the position of his head in space. In 4 of our patients subject to syncope, if the head were acutely flexed or extended upon the trunk, syncope could not be obtained, or only with very great difficulty, even though the patients sat erect. In the fifth patient, on the other hand, syncope could be obtained in the erect position only if the head were acutely flexed. Conversely, it was found that syncope could be obtained in the supine position of the body if the head were acutely fixed or extended upon the trunk. These observations suggested that vestibular function played an important role in the induction of the observed syncope. Since repeated caloric stimulation of the semicircular canals of these 5 patients was found to have no effect either in accelerating or inhibiting the production of unconsciousness after sinus massage, it was considered that it was not that portion of the vestibular apparatus concerned with statokinetic reflexes (2) but possibly the utricular portion of this same system (concerned with static reflex activity) which was involved in the induction of syncope herein described.

IV. DISCUSSION AND SUMMARY

In the preceding paragraphs, evidence was obtained to indicate that a considerable number of N.C.A. patients were subject to episodic attacks of cardiovascular, respiratory, peripheral neurogenic dysfunction, and syncope, a phenomenon not stressed in the present literature. The recognition of the occurrence of such attacks in N.C.A. patients while *at rest* appeared to us to be of prime importance in an approach to an understanding of the pathogenesis of this syndrome. For these abrupt unpredictable exacerbations of the usual manifesta-

tions of this illness furnished irrefutable contradiction to those theories which explained the disorder as one of functional breakdown during the expenditure of effort alone. Furthermore, the occurrence of these attacks implicated the involvement of some portion of the central nervous system containing many closely situated and integrated centers concerned with adrenergic and cholinergic functions.

In view of the fact that the hypothalamus has been found (1, 15) to contain not only the governing centers of the autonomic nervous system but also centers concerned with respiration, it seemed quite likely that this area of the diencephalon was the focus from which the various types of discharge arose. It should be pointed out that experimental stimulation of the hypothalamus has been found (14, 15, 16) to be followed by the appearance of practically all of the phenomena which were observed in this study except for syncope. Even the appearance of this last phenomenon might have been due to augmentation of the normal sinus discharge (3) rather than sensitivity of the carotid sinus itself, an augmentation primarily due to some dysfunction of the supposed area of consciousness in the hypothalamus (14). The emotional discharge seen in several of the patients following sinus massage also might have been of hypothalamic origin, for the somatic display of emotion without cortical recognition of such has been described (13) in hypothalamic excitation.

In this and previous studies, much evidence has been obtained which suggested that the hypothalamus was of prime concern in the pathogenesis of many if not all of the somatic manifestations of neurocirculatory asthenia. It must be stressed, however, that the evidence suggested that the hypothalamus was the *mediating*, not necessarily the initiating, source for the production of the N.C.A. syndrome. Whether this hypothalamic involvement was due to a) factors directly affecting the hypothalamus initially or b) factors directly acting upon other presumably higher centers of the central nervous system (which in turn effected changes in the hypothalamus) could not be determined.

The similarity of the types of discharge described in this present communication to those seen in patients suffering from an overt anxiety neurosis was striking. The only true difference was that in our study the discharge occurred in patients who did not present in an overt fashion the typical personality seen in patients with an anxiety neurosis.

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PSEUDO-HERMAPHRODISM

A Psychosomatic Case Study *

LEONA M. BAYER, M.D.**

Pseudo-hermaphrodism is such a crucial developmental disturbance that every aspect of the constitution is affected by it. In the case of Helen, now 20 years old, there are both cross-sectional and longitudinal data at three age levels. Material is presented chronologically under appropriate headings. We are very grateful to the many departments in which the patient has been treated or studied for their several contributions to the record. Specific acknowledgments appear in the course of the paper.

Presenting complaints have been her masculine stigmata; she has always wished to be more feminine. *Physical build* has become increasingly more dysplastic, although analysis shows that in deviating markedly from the feminine it still does not achieve normal masculine dimensions. *Surgical explorations* have demonstrated rudimentary ovary and female organs; no male gonad; markedly hypertrophied clitoris; characteristically enlarged adrenals. The main *laboratory findings* have been the consistently high output of 17-ketosteroids. *Psychologic studies* outline a curious patchwork of avowed preference for the female rôle, supported by concern with deep feminine problems, as revealed by projective technics, but contrasting with some strong masculine overt interest patterns.

HISTORY

The patient comes from a simple country family of Mediterranean origin. The mother died when the patient was 4 years old. When she was 5, her father moved with her and her older brother to the family of a paternal aunt. There were 7 cousins: 2 older girls and 5 younger boys. Helen lived at home, went to school and was apparently happy in her environment. She was living ostensibly as a girl when, at the age of 11 years, a physician saw her during a traveling Crippled Children's Program examination. It is noteworthy that the impetus for investigation came from the examining physician rather than from the family.

During the first hospital entry in January, 1938, it was learned that the genital anomaly had been present at birth. Pubic and axillary hair had appeared as early as the fifth year, and more recently the appearance of hair on the face and chin had necessitated shaving. Physical and psychologic examination merely recorded her virilism and mental limitations. The family objected to any surgical procedures.

Four years later Helen entered the hospital again, being now almost 16 years old. Although her home community had continued to treat her with tolerance and sympathy, she was unhappy with her equivocal sex and wanted to submit to whatever procedure might make her more feminine. In the nude she appeared like an odd boy, with still more virile build than originally noted; facial hair which required daily shaving, and a deepening voice. At this time pelvic examination showed an urogenital sinus about one inch deep. No uterus or ovary could be palpated. Attending physicians concluded that, as far as could be determined without seeing the gonads, the patient was probably a biologic male. It was planned to explore the abdomen and if testicles were found, to bring them down as a first step toward establishing a more masculine state. Helen's consent to this plan was won only through the enthusiasm of the house staff, who never doubted the existence of a basic masculinity, nor its self-evident desirability. Having been persuaded to cut her hair and consider a boy's name, she finally pointed to her girl's clothes and said, "Take the damned things away. I never want to see them again." Surgery, however, revealed atrophic ovaries, tubes, and an uterine ridge. There were no testicles. She was "thrilled to pieces" to be definitely declared feminine, and again left the hospital to take up life as a girl.

After graduation from high school, Helen applied for admission to a training school for nurses. While this application was still pending she enrolled in a junior college. In November she consulted the Endocrine Clinic. Exploration of the adrenals and amputation of the clitoris were suggested, but temporarily postponed. Meanwhile, the unlikelihood of a nursing school accepting her was

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FIG. 1. Age 11 years, 6 months.

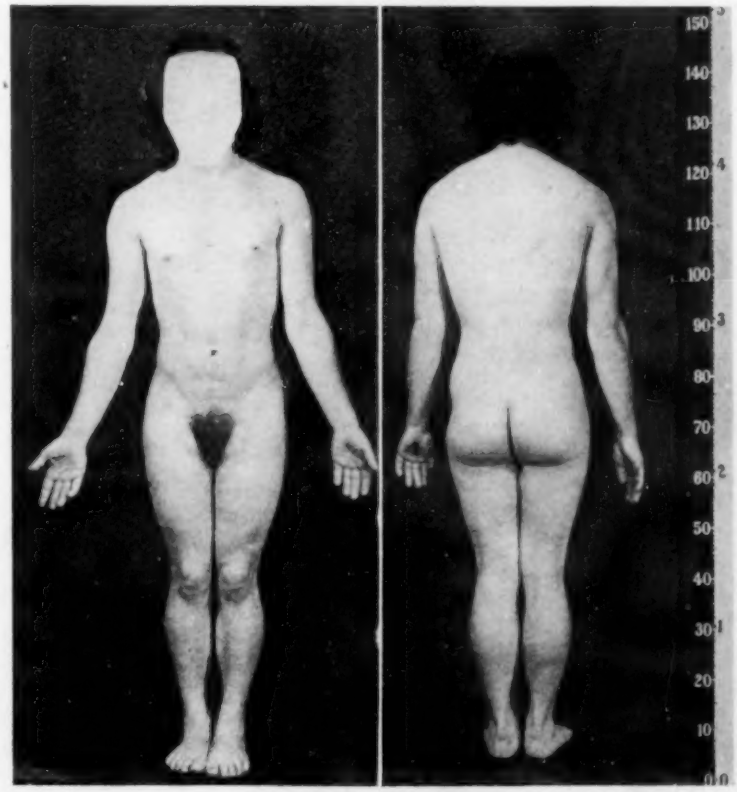

FIG. 2. Age 15 years, 9 months.

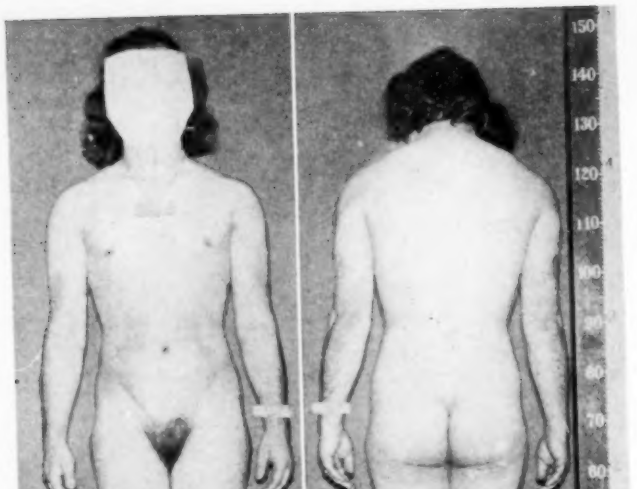

FIG. 3. Age 18 years, 4 months.

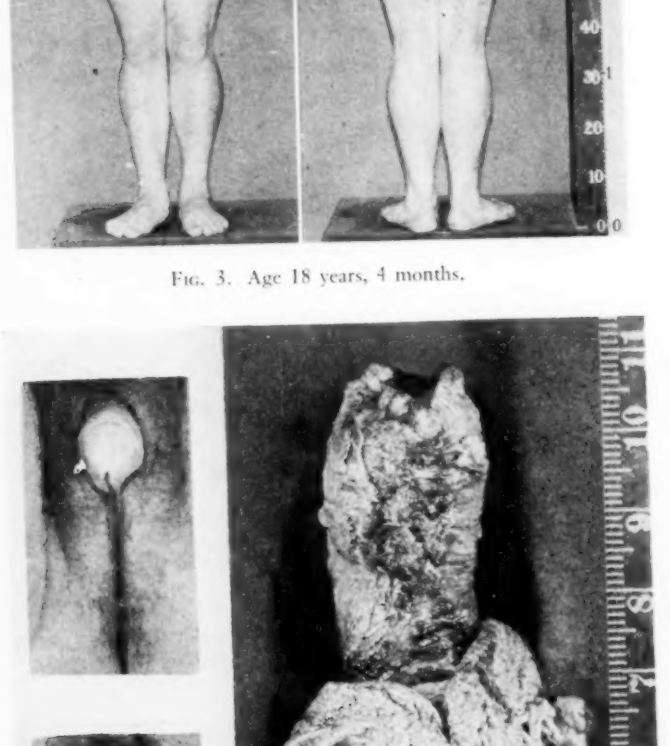

FIG. 5. Clitoris

pointed out, and the vocational alternatives of dental nursing or laboratory technician were suggested. These, however, did not then appeal to her.

During this period, Helen told an inexplicable but steadfast story about menstruation, which is herewith recorded. She said that the first period started during August, 1944, age 18. There were two more monthly periods subsequently, each lasting about four days with a very scant flow and a little "odd" feeling as the only accompanying malaise. The fourth period was in December, when she again reported three days of bleeding which was noted especially after micturition. This is the last such episode reported.

In February, 1945, Helen returned for surgery. The clitoris was amputated; some days later both adrenals were explored and the right one removed. She made a rather stormy recovery because of a right lung atelectasis, but without signs of adrenal insufficiency.

Since then, she has maintained contact with the Endocrine Clinic at appointed intervals. She is pleased about the plastic operation; disappointed that the adrenalectomy resulted in no feminization. The facial hair is kept under control by shaving.

When, in fact, her nursing application was denied, Helen enrolled in a technical school and successfully completed the course. She is now situated in a large city, where she has a very satisfactory job.

BODY FORM

Physical examinations were normal except for moderate hypertension and the specific manifestations of hermaphrodism. Gait, stance, manner, and voice have frequently been described as masculine. In addition to the general observations already noted, the abnormalities of body form are documented by measurements (Table I) and photographs (figures 1, 2, 3). When this material is compared with anthropometric norms (2), and studied by Bayley-Bayer Standards for Somatic Androgny (1), the following interpretations can be made.

January 11, 1938, age 11-6: Measurements indicate that weight is heavy for a girl and heavier still for a boy. Stature is normal for either. Weight/stature ratio is normal for girls; much too large for boys. Sitting height/stature ratio is large (observation from photo), *i. e.,* the child is very short-legged. This short-leggedness suggests early maturation and eventual dwarfism. With regard to contours, only the curve of buttock and thigh looks feminine. Masculine form is shown in the surface modeling, shoulder girdle, waist line, and lower leg muscles. Absence of breasts, the presence of a hypertrophied clitoris, sagittal pubic hair pattern, facial hair, and diffuse body hair emphasize the masculinity. The large hands and feet also look boyish.

TABLE I

ANTHROPOMETRIC MEASURES

Date	Jan. 11, 1939	April 15, 1942	Nov. 11, 1944
Age	11 yrs. 6 mos.	15 yrs. 9 mos.	18 yrs. 4 mos.
Pulse	80	80	76
B.P.	140/90	120/76	144/90
Weight, Kg.	51.3	54.9	59.4
Stature, cm.	149.9	151.5	152.1
Sitting height, cm	....	86.2	88.0
Biacromial breadth, cm	....	37.4	37.6
Bicristal breadth, cm	....	23.9	24.2

April 15, 1942, age 15-9: At this time the divergence between male and female characteristics is more marked. Stature is short for a girl; even shorter for a boy. Bicristal is narrow for both; more narrow for girls. The biacromial breadth is too broad for a girl. Measurements relative to stature are too large for either girls or boys on account of small stature. Bicristal/biacromial index is too small for either sex, but smaller for female. Photographs record that the surface modeling and shoulder girdle are now hypermasculine; the body and facial hair more dense; the head hair is receding at the temples. There is no breast development, but the feminine curve of buttock and thigh is still more pronounced.

November 11, 1944, age 18-4: Measurements are not much changed since 1942, except that there has been some increase in stature, almost all of this being in trunk rather than leg length. The bicristal diameter remains absolutely and relatively narrow. Hair recession at the temples has increased. The continuing hypermasculine trend in the upper body is curiously balanced by the development of a hyperfeminine thigh pattern. A fortuitous change in photographic technique suggests a softer surface modeling than actually existed. The androgynic

pattern is shown on a rating form especially devised for this purpose (figure 4).

These analyses imply abnormalities in all phases of sexual differentiation: the *direction* is bisexual; the *degree* is exaggerated in both directions; the *tempo* of maturation has been accelerated. This latter is evidenced by an "old look" at all three age levels, by the characteristic short-leggedness result-from early epiphyseal closure, by a mature skeletal age at 15 years 9 months, and by the hair recession which already, before 16 years, gives her the appearance of a balding man. It should be mentioned that the abnormally small bicristal/biacromial or trunk breadth index has been noted in reports of other pseudo-hermaphrodites.

Genital abnormalities are likewise illustrated by photographs (figure 5). In 1938 the hypertrophied clitoris was described as "a penis of hypospadic type, rather short, and with a short foreskin. There is no meatus. There is a bifid underdeveloped scrotum which has the appearance of labia. No testicles are felt." When the urethra was explored by Dr. J. R. Dillon, Division of Urology, with an F14 catheter, another orifice was probed posteriorly which was covered by a thin fold resembling a hymen. The curved clamp was introduced into the pouch resembling a vagina; it entered for 1¼ inches.

The internal organs are described in the surgical and pathologic reports.

X-RAY REPORTS

Excretion urograms and skull plates, January 12, 1938: normal.

Bone age, April 17, 1942: adult.

Pelvis, November 18, 1944: D/K index (ratio of midsagittal diameter of the fore pelvis to the bi-ischial spine diameter multiplied by 100. (100x7.7/8.8=95.) According to Henry and collaborators this is therefore a borderline pelvis (3).

Pyelograms, December 19, 1944: normal; no evidence of adrenal tumor.

Skull studies, January 13, 1945: no abnormalities; no evidence of enlargement of sella.

LABORATORY REPORTS

Urinalyses were normal except for glycosuria up to 3 per cent during one glucose tolerance test (v. i.).

Blood counts were noteworthy in that there were two high red blood counts of 6.1 and 5.1 million in 1938, with a hemoglobin reading of 17.2; another red blood count of 5.8 million, hemoglobin 18 Gm. in 1942; and another hemoglobin reading of 18 Gm. in 1945. White and differential counts were normal.

Glucose tolerance curves before and after adrenalectomy were of quite different shape. The first one was a few days after the clitoris amputation; the second one followed two weeks after the adrenalectomy.

FEBRUARY 13, 1945, GLUCOSE TOLERANCE TEST: 100 GM. GLUCOSE

Specimen	Urine sugar per cent	Blood sugar mg. %
F	0	69
½h	0	210
1h	¼	250
2h	1	282
2½h	3	222

MARCH 2, 1945, GLUCOSE TOLERANCE TEST: 100 GM. GLUCOSE

Specimen	Urine sugar	Blood sugar mg. %
F	—	82
½h	0	135
1h	0	175
2h	0	164
2½h	0	109

Blood chloride level did not change after the adrenalectomy:

February 13, 1945	593 mg. %
March 20, 1945	595 mg. %

Basal metabolic rate, December 8, 1944, calculated according to Boothby-Berkson standards, on the basis of surface area: +22%.

Dr. Peter Koets made twenty determinations of *urinary excretions of 17-ketosteroids.* The output has ranged from 121 to 293 mg. per twenty-four hours, whereas the average comparable normal values are 9 mg. for women, 14 mg. for men. Table II and figure 6 show the readings related to the right adrenalectomy and to three periods of treatment with estrogenic substances. Creatinine measurements and urinary volumes are given as indicators of reliability.

The observed variations must be interpreted cautiously. It appears that the androsterone output was lower after four months of treatment with parenteral estrone, just before adrenalectomy. Adrenalectomy has no demonstrable effect. After the adrenal surgery the level gradually climbed back to its previous heights in spite of small oral dose

of synthetic estrogenic substance. During a second period of estrone injections the 17-ketosteroid output was measured weekly; the level of excretion seems again to have dropped, but only a little.

SURGICAL AND PATHOLOGIC REPORTS

All three operations were performed by Dr. J. R. Dillon. The pathologic reports are by Dr. W. H. Carnes.

ANDROGYNIC PATTERNS OF BODY FORM: RATING PROFILE

Bayley-Bayer Standards*
17–18 Year Norms

Name **Helen** Sex M (F) Date **Nov. 11, 1944** Age **18-4** Skeletal Age **Adult** Case Number

ITEM ("A" through "H" from rear-view photographs)	RATING				
	Hyper-masculine 1	**Masculine** 2	**Intermediate, A-sexual, or Bi-sexual** 3, 3a, 3b	**Feminine** 4	**Hyper-feminine** 5
I. **A. Surface modeling**	Exaggerated hardness of relief.	Strong muscle molding. Bone, vein and tendon prominences.	b. Muscular and fat. / a. Little muscle or fat.	Smooth and soft, with little muscle.	Very soft, fat, no muscle.
II. **Trunk Contours** **B. Shoulder girdle**	Massive.	Appears wide, heavy and muscular.	b. Muscular and fat. / a. Narrow, "bony."	Slight, soft and narrow.	Frail, softly fat.
C. Waist line	Marked torso narrowing to low waist: may have minimal indentation.	Slight indentation due to narrowing of torso.	b. Broad hip and shoulder; little indentation. / a. Slight symmetrical high concavity.	Definite line accentuated by hip widening.	Marked indentation.
D. Hip flare	No widening.	Slight widening of hips from waist.	Intermediate.	Flares into wide hips laterally and posteriorly.	Marked flare.
E. Buttocks	Very flat.	Flat and angular.	Intermediate.	Rounded and full.	Very broad and rounded.
III. **Leg Patterns** **F. Thigh Form**	Cylinder and/or bulging muscles.	Approaches cylinder. Lateral outline convex.	Intermediate.	Funnel, fat and rounded. Lateral outline concave.	Fat, wide-top funnel.
G. Interspace (whole leg)	Very open.	Open center above and below knees.	Intermediate.	Closed center except small space below knees.	Thighs and knees together, feet apart.
H. Muscle bulge (lower leg)	Strong bulge, no fat.	Prominent inner bulge of gastrocnemius.	b. Moderate muscle bulge. / a. No muscle bulge; spindly.	Slight inner bulge; shapely, smooth, outer curve.	Very little muscle, but smoothly rounded and outer curve.
J. Penis size	1 Very / 1.5 Large	2 Average	2.5 Small / 3 Very		
K. Breast size			3 Very / 3.5 Small	4 Average	4.5 Large / 5 Very
L. Body hair density	1 Heavy on thighs, etc.	Easily discernible	2.5 Sparse. / (3) ♂	♀ Absent	
M. Pubic pattern	Disperse / Acuminate.	Sagittal	♂	Horizontal ♀	
N. Bicristal / Biacromial Index	−←65	69 — 73	74 — 76	77 — 82	83→+
P. Strength (Kg) Grip (R+L)+Thrust +Pull	+←244	243 — 186	185 — 148	147 — 110	109→−
Grip (R+L)	+←126	125 — 95	94 — 80	79 — 59	58→−
Androgyny Score (Sum of "A"–"H")	8 — 12	13 — 19	20 — 25 (A)	26 — 34	35 — 40
Characteristic Description (Circle one)	**Hypermasculine**	**Masculine**	**Intermediate** Bisexual **Asexual** **Disharmonious**	**Feminine**	**Hyperfeminine**

Supplementary Criteria

FIG. 4. Androgynic pattern of body form: Rating profile.

April 20, 1942.

Operation:

1. Exploration of right inguinal canal
2. Laparotomy, exploration
3. Right hemi-oophorectomy
4. Appendectomy

Findings:

1. A cord in right inguinal canal without demonstrable vas deferens. Traction on this cord brought into view:
2. A fimbria at the end of an atrophic fallopian tube which was found to join the left tube at the vault of the vagina to form a possible bifid uterus
3. Atrophic ovaries, normally placed
4. No palpable abnormalities of adrenals
5. Normal appendix
6. *No male gonads* found

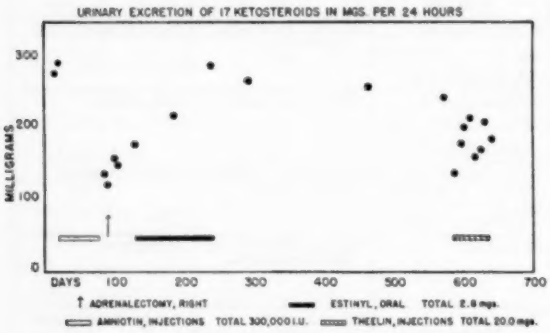

FIG. 6. Urinary excretion of 17 ketosteroids

Pathology: (ST42-278) The appendix is grossly and histologically normal. A piece of ovary measures 1 x 0.5 cm. has a smooth surface, and appears grayish pink on section. Histologically, the ovarian stroma looks normal. There are many primordial follicles. There is vacuolation of some of the ova. One small developing follicle, or follicular cyst, is lined by a thick granulosa layer, which is surrounded by a prominent highly vascular theca interna. There are several atretic follicles. No corpora lutea are found. There are occasional very small tubular spaces lined by a single layer of columnar epithelium.

February 9, 1945

Operation: Amputation of clitoris

Pathology: (ST45-152) The formalin-fixed clitoris is 5.5 cm. long and about 2.5 cm. thick. It is covered by thick, pinkish-brown, wrinkled skin

TABLE II

URINARY EXCRETION OF 17-KETOSTEROIDS IN MG. PER TWENTY-FOUR HOURS
(Measured on crude extract and calculated as androsterone)

	Date	Treatment	Mg. 17-ks	Mg. Creatinine	Cc. Volume
1944	Nov. 20		278	....	1260
	Dec. 4		293	....	1420
	Dec. 9	Amniotin started. 50,000 I.U. in oil intramuscularly at weekly intervals.			
1945	Feb 3	Amniotin stopped. Total 300,000 I.U.			
	Feb. 9	Amputation of clitoris.			
	Feb. 15		136	....	1480
	Feb. 18		121	....	1290
	Feb. 19	Adrenalectomy, right.			
	Mar. 2		160	....	1520
	Mar. 5		150	....	1750
	Mar. 30		178	....	2000
	Mar. 31	Estinyl started—0.05 mg. daily for two weeks alternating with two weeks rest.			
	May 26		218	....	1890
	July 20		288	....	1890
	July 31	Estinyl stopped. Total 2.8 mg.			
	Sept. 10		266	....	1750
1946	Mar. 4		259	....	1660
	June 22		242	1875	1500
	June 22	Theelin started. 2 mg. suspension intramuscularly at weekly intervals.			
	July 6		186	1584	950
	July 15		178	1850	1380
	July 22		202	....	950
	July 29		214	1900	1050
	Aug. 5		160	1620	1300
	Aug. 12		170	1885	1365
	Aug. 19		209	....	950
	Aug. 24	Theelin stopped. Total 20 mg.			
	Aug. 26		185	....	1150

and has a slightly redundant prepuce that overhangs the glans about 1 cm. The glans itself is about 1.5 cm. long. A deep groove in its inferior surface extends to the tip. In the proximal end of this groove there is a tiny orifice that easily admits a probe 1 mm. thick. A small blind pouch 2-3 mm. long lies beneath this orifice. The corpora cavernosa are about 12 mm. in maximal thickness at their proximal ends. No corpus spongiosum or urethra is found.

A histologic cross-section of the clitoris shows corpora cavernosa of normal structure and a typical arteria profunda. No corpus spongiosum or urethra appears in the section.

February 19, 1945

Operation:

1. Bilateral exploration of kidneys
2. Removal of most of right adrenal

Findings:

1. Tough periosteum and cartilage of left 12th rib "as of a much older person"
2. Slightly enlarged left adrenal, with an unusual blue color, characteristic of the adrenal in pseudo-hermaphrodism
3. Enlargement of right adrenal which contained a pea-sized firm nodule. It was the same color as the left gland, and was both friable and adherent

Pathology: (ST45-98) Approximately 19 Gm. of broken fragments of chocolate-brown adrenal tissue are received. In some of these fragments a thin yellow subcapsular zone 1 mm. thick can be seen. The average width of each layer of the cortex is approximately 5 mm. All the tissue is essentially similar, except for one rounded nodule in the cortex 4 mm. in diameter, which is bright yellow.

Histologically, a thin normal zona glomerulosa is seen. The zona fasciculata is from 30 to 50 cells wide. It is composed chiefly of large pyramidal cells with finely granular acidophilic cytoplasm. It rarely contains a typical spongiocyte. The cytoplasm of many of these cells appears hyaline. The bulk of the cortex is made up of an abnormal zona reticularis. This is composed of large cells with acidophilic, finely granular or hyaline cytoplasm similar to the cells in the zona fasciculata. They differ from the cells in the latter zone in that the cytoplasm contains much fine to coarse, granular, pale brown pigment. The cytoplasm of some of the cells also contains a number of small, short, rod-shaped, faintly basophilic granules. The pigment in this zone does not reduce silver nitrate as melanin does. It fails to give a Prussian-blue reaction for iron. It does not stain with Sudan IV or with basic fuchsin and is not acid fast. The cytoplasm of the cortical cells shows no affinity for the fuchsin. Several fragments of adrenal medulla are essentially normal and give a strong chrome reaction.

The changes described in the adrenal cortex are quite typical of those occurring in the adrenals in female pseudo-hermaphrodism.

PSYCHIATRIC REPORTS

Psychological observations include interviews and tests at the first two hospital entries, and again early in 1946. This material was collected by various observers, and is presented in some detail because of scarcity of such published data in hermaphrodism.

Interviews

Material is quoted from the reports with regard to a few central questions.

Attitude toward sex

January 12, 1938. No embarrassment nor concern is shown. Definitely prefers to be a girl although no reasons are given. When asked how she would like it if examinations proved she was a boy, she only makes a grimace and shrugs her shoulders.

April 17, 1942. There is a note concerning the following definitions given with obvious emotion during a Stanford-Binet:

Peculiarity = be different from somebody else; something different
Courage = have faith, keep going when you aren't happy
Defend = defend yourself, watch out for yourself

April 28, 1942. "Thrilled to pieces" that she turned out to be a girl after all.

March 16, 1946. She believes boys and girls should be treated similarly when younger, different when older. Upon being asked why, she says because boys get into more fights. It would be easier to raise a boy than a girl, but a boy would have an easier time in the world. If a girl doesn't get married and has little education, she would have a difficult time. If she marries and her husband has a good education, that would be fine. A man has an easier time getting a job.

Attitude toward parent figures

March 16, 1946. Her father and aunt are inadequately described. Her father likes to hunt and fish, and when she was small he took her fishing

with him. The whole family used to go on picnics together and this was fun. She always talked to her father about her school problems and went to him for money, but she talks with her aunt too. She has much regard for her aunt, but her father comes first. She does not think she is much like her father; he gets angry at times and is quick-tempered. Her aunt is quiet, but she sort of likes to have her own way. If she makes up her mind to do something, she will do it or die. The patient thinks it is "o.k. away from home, but I would just as soon be home." It was easier to mind father than aunt who "required things I just couldn't see."

Attitude toward friends

March 16, 1946. She has usually gone with groups rather than with one or two special friends. She attended school dances, but does not seem to have been enthusiastic about them. She prefers to be with people her own age, but usually is with older people. When asked if she prefers men or women companions, she pauses for a long time and then says if she could choose, she would say women.

She shows great inability to describe people and falls into silence when asked for specific characteristics. The most she can say is, "She was nice," or "She's a good kid." She had one girl friend with whom she used to read in the school library, and when asked how they got along together says, "She had to do everything her way." She seems resentful but resigned to this.

In general, her social attitudes could be characterized as extroverted, and lacking in insight.

Miscellaneous attitudes and activities

March 16, 1946. She sleeps well and remembers no dreams. She never had any feeding idiosyncrasies. Used to bite her finger nails until she graduated from high school, but doesn't any more. As to her growth and development, she says she had gland trouble; used to be pretty thin. Now she's average. She likes to be active; there's nothing to do at her cousin's cabin, she "goes crazy just resting." She prefers bright to subdued colors, and plain tailored clothes, but once in a while likes something with ruffles.

Her father bought her a trombone when she was in the seventh grade and she played in the school band for three years. She also played in the annual music festival and at school games. She belonged to the Ski Club, and worked in the school library one year when she was a sophomore. She used to play tennis, bowl, ice skate, and ski in high school. Now she belongs to the Literary Guild and reads a book a month. Recent books she has enjoyed include "Leave Her to Heaven," "Razor's Edge" and "So Well Remembered." She attends the movies about three times a week, likes love and mystery stories best, but only if they are realistic. Her favorite stars are Irene Dunne and Cary Grant. Her favorite radio programs are "Amos 'n Andy" and "Lum and Abner."

If she could have three wishes, her first would be for an automobile; she can't think of any others. She smiles and is pleased as she relates how her brother taught her to drive. She would like to be 21 years old because then she would be of age. She would like to be an inch or two taller. She is unable to say what she would like to look back upon at 70 years.

Intelligence Tests

January 12, 1938. On the Stanford-Binet, Form "L," when the chronologic age was 11-6, the mental age was found to be 9-6, giving her an I. Q. of 83, with a rating of dull normal. Her special disabilities included poor memory, poor abstract judgment, poor comprehension, and poor analytic judgment. Special abilities were good visualization and good grasp of practical situations.

April 17, 1942. Again on the Stanford-Binet, Form "L," when the chronological age was 15-9, the mental age was found to be 12-6, giving her an I. Q. of 84, with a rating again of dull normal. The same test was repeated ten days later and the I. Q. found to be 99, but this result must be regarded with reservations, due to the repetition of the test after so short an interval.

May 29, 1942. When the chronological age of the patient was 15-10, her I. Q. was found to be 92 on the Otis Self-Administering Higher Form A; I. Q. 99 on Exercise 3 of the Terman-Miles Attitude Interest Analysis, Form WA; and on a Scaled Information Test she scored at the norm for 17 year olds in the eleventh school grade.

March 2, 1946, at the age of 19, a rough estimate of intelligence was obtained by use of the Stanford-Binet Vocabulary. Her score was 19½, giving her a rating of "Average" intelligence.

Interest Tests

On May 4, 1942, when the patient was 14-10, the Strong Vocational Interest Test was administered. From this test an interest pattern, an occupation level or ambition score, and an M-F were obtained. The patient's *interest pattern* was creative-verbal-scientific (as opposed to literary-artistic, etc.); a

predominantly masculine pattern. Her *occupational level* was 60, which is very high, and it is noted that this is far above her ability as determined by results upon intelligence tests. Her *M-F* score on the men's scale was 36, which is in the direction of extreme masculinity; only 20 per cent of men reaching or exceeding this score. Scored on the scale for women, her M-F score was 31, putting her in the 97th percentile; only 3 per cent of women being as masculine in interests.

The Terman-Miles Attitude Interest Analysis Test was also given in 1942. Helen scored more masculine than 80 per cent of the girls and 30 per cent of the boys her age. In other words, 20 per cent of girls and 70 per cent of boys were more masculine than the patient. These results indicate a slight differentiation in the masculine direction.

In April, 1946, when the patient was 19 years old, the Terman-Miles Test was repeated. On this occasion she scored in the 58th percentile for women college sophomores, and below the 5th percentile for males of the same class. Thus, only 42 per cent of women and 5 per cent of the men of this class were more feminine in interests than she. At the age of 19, therefore, this test shows increased differentiation toward femininity.

An additional interest test, the Kuder Preference, was given at the age of 19. The results are similar to those obtained on the Strong Vocational Interest Test at an earlier age. Her profile showed outstanding interests in scientific-mechanical-social service, in all of which she scored above the 90th percentile. Her outstanding interest field was scientific, in which she scored above the 98th percentile. She was below the 30th percentile in artistic-persuasive-literary-musical interest, scoring below the 20th percentile in the last three, and below the 1st percentile in musical interests.

Interpretation of these results must take cognizance both of the several types of tests involved and of the age factor at the times of administration. Since the Strong and the Kuder are primarily vocational tests, and the Terman-Miles a personality test, they may reasonably be summarized by saying that the patient has developed toward an attitude-interest pattern which is definitely feminine, but has retained an occupational interest pattern which is more characteristic of men than of women in our culture.

Notes on Rorschach Test

March 16, 1946. This record is not remarkable in respect to color or shading shock. Evidently the patient is not neurotically inclined, nor is she abnormally depressed. Although the ego is not at all strong (poor form responses), feelings of inferiority are not overwhelming to her. She is somewhat lacking in vigor and drive in meeting her problems, there being a tendency to drift and accept circumstances as they are (FY).

The patient's low average intelligence is manifested by the following: no whole, few movement, high animal, few good form, loose and minimal avenues of approach. Poor intelligence and/or meager cultural background is also indicated by a narrow range of content. With the emphasis on large detail, and practically no whole responses (only cut-off W), it is evident that the patient attends, primarily, to the obvious and practical, and is a concrete rather than a theoretical, over-all thinker. There is no particular drive for completeness or coherence.

Few human movement responses (along with F−) show that there is a personality need in the patient. She is limited in imagination and creativity, and any fantasy that she might have is of the wish-fulfillment type rather than of a constructive nature. She is primarily extroverted and enjoys social situations.

No pure color or CF responses indicate a lack of sensitivity to the usually exciting elements of life. What feeling there is in this girl is inhibited and restrained by a keen awareness of reality. Although actuated by a certain degree of emotional feeling, she is able to master it. She is not likely to be impulsive or explosive in temperament, but is inclined to be more of a calm nature. There is, on the other hand, a capacity for sympathy and friendliness.

Thematic Apperception Test

March 2, 1946. The pictures are from the 1943 edition.

7GF Mother and daughter. Daughter is holding a doll in her arms. She's probably telling her about the problems she'll face in life. The mother is holding a book in her hand and is probably reading short phrases to the daughter. The daughter is looking out into mid-air; she probably don't know what to think about all this. (Q) Well, she's about the age where she starts menstruating and she wonders what that is. That's what the mother is trying to explain to her—where babies come from. (Q) (Intense emotional outburst at being asked what happens. After long silence she says angrily, flushing, "Oh, I don't know!")

12M Looks as though the man has the boy hypnotized. I suppose in hypnotizing a person is

when you let your mind wander to theirs and think along the same track for a certain period of time.

9GF Looks like one of the girls is running away. Something may have frightened her to make her run. This girl hiding behind the tree looks like she may suspicion the girl who is running. (Q) Maybe someone got murdered. Well, I think she must be running for help. I think this girl hiding behind the tree knows something about the murder; maybe she'll try to blame it onto the other girl. (Q) Who runs? Don't know, possibly a baby, because the girl behind the tree has a purse and a baby's bonnet in her hand. (Q) She might have been wading in the edge of the ocean there, or she let it go out too far and it drowned. (Q) It looks sort of suspicious because one girl is hiding back instead of both running for help (Q) Yes, that's its mother; the one running for help. (Q) There is nothing in the picture that indicates what might happen.

17BM It might be the 4th of July and they're having a rope climbing contest. This boy is one of the climbers. The first climber that gets to the top of the rope wins a prize. (Q) He gets to the top first and wins a golden trophy.

13B This is a log cabin out in the hill, made of logs with mud in between to fill in the cracks. The little boy is sitting in the doorway taking in the morning sunshine. He's sucking his thumb while waiting for his mother to come back from town.

6GF I have no idea. The husband and wife are discussing the problems of the day.

4 Rejected.

12F This woman in the front here, she's an actor in the theater. And the old woman in the background; that's just a painting on the wall for scenery. It's a play given at Hallowe'en time, about a haunted house.

2 The girl with two books in her arm, she's just returning from a field where her father is plowing. She's on her way to school. The mother is standing on top of the hill watching her husband work. In the background you can see the barn and one of the helpers. He has a horse; he's plowing also. This is springtime. They must get their crops in before it rains.

13G This looks like a gang plank on a ship—don't know if it is or not. This girl is going aboard a steamer. She's a Chinese woman going back to visit China. (Q) She arrives in China in six days. There's a number of her relatives there to meet her when she arrives. Her relatives live in a houseboat on the edge of the water. The environment is very different to that of the United States. She visited all the people that she used to know over in China. Three weeks passed very rapidly and it was time to start home—back to the good old U. S. A.

DISCUSSION BY PSYCHIATRIST

On the basis of the foregoing data and her brief personal contacts with the patient in 1938 and 1942, Dr. Mary H. Layman, Department of Child Psychiatry, has given us the following interpretations and evaluations of the material.

What is the contribution that can be made by the psychiatrist? First and foremost, the psychiatrist and psychologist can and should add their findings to those of other specialists (gynecologists, surgeons, endocrinologists, etc.) as part of the extensive armamentarium which modern medicine can now bring to bear on the investigation of puzzling cases like pseudo-hermaphrodites. The psychologic attitudes and inclinations are of particular importance in such cases, because of unusual difficulties facing these individuals in their adjustment to self and society.

Psychologically, several questions come to mind:

1. What wish or consideration prompted this child's parents to raise it as a girl, when the physical findings (external genitalia) at the time of birth apparently allowed of no more definite diagnosis than "half and half?" (The birth certificate is not available.)

2. What were the patient's reasons for so desperately clinging to her rôle of female, when, as early as the age of 5, precocious masculine development was apparent?

3. What should be the physician's part, if any, in influencing the psychologic attitudes of an apparently bisexual being, with a view toward the individual's best adjustment to himself and society?

Concerning the first question, the length of time elapsed since the patient's birth and the mother's death, when the patient was 4 years old, conceals irretrievable, valuable information about the early environmental influences in the patient's life. However, it would not seem far-fetched to assume that the mother, after the happy arrival of a first-born son, should have wished the second child to be a girl, and have reared the half-and-half individual accordingly.

Concerning the patient's own continuation in her appointed rôle despite the growing sex inappropriateness of her appearance, might one perhaps credit the interstitial tissue of the hypoplastic ovaries with sufficient activity to bring about not only the female contour of hip and thigh, but also to direct the patient's feminine psychologic proclivities? But in this connection, one must acknowledge the power

of environmental influences, the strength of public opinion, the weakness of initiative, and the usually existing desire to "save face"—all of which make it extremely difficult to "change horses in mid stream" or rather "change sex in midlife."

Concerning the rôle of the physician in guidance, it should be emphasized that the psychologic attitudes of the patient do not parallel either the secondary sex characteristics nor the anatomy of the internal sex organs, nor have they been influenced by operative procedures after puberty. Education must clearly be accepted as a powerful factor in personality development in such an abnormal child, no less than in normals.

It would therefore seem desirable to make determinations of the basic sex as early as possible and to institute guidance before the child has laid down permanent patterns of behavior. But at all times, individual trends and wishes, as well as age, should be taken into consideration, there being to date no proof that biologic bases for masculinity-femininity attitudes are *not* present, and since, at times, as in the case under discussion, findings can strongly suggest the presence of a biologic determiner.

CONCLUSION

Besides recording the many facets of available somatic and psychologic material, such a study offers an unusual temptation to look for psychologic reflections of a deviate configuration. The physical picture is dominated by the striking contrasts in the androgynic pattern of body form and in the genital development. All other physical data merely amplify this basic fact with which we start. The personality picture presents a not dissimilar "androgynic" design. But, as Dr. Layman has pointed out, it is difficult to assign either biologic or environmental causality to the psychologic trends. The very contradictions in the personality suggest, however, that here is no simple social response; that biology must have played some active part in fashioning it.

Although this protocol may not illuminate the dynamics of psychosomatic relationships, it does permit a word to be said for the psychosomatic viewpoint in treatment. Neither hormones nor surgery have effected any improvement in the patient's biologic status. Her present good social and vocational adjustment may be attributed to her own toughness, to the support of her environment, and perhaps in some small part to sympathetic personal guidance in the Endocrine Clinic. Where modern endocrinology still knows so much less about therapy than about diagnosis, it is especially important that the physician focus on the total patient rather than on his constitutional aberration.

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THE EXPERIMENTAL INDUCTION OF ACUTE ANIMAL BEHAVIOR DISORDERS AS A METHOD IN PSYCHOSOMATIC RESEARCH

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Considerable experimental interest was evoked in the psychologic laboratory by N. R. F. Maier's (17) attempts less than ten years ago to relate a noise-fright induced disorganization of behavior in the rat to frustration in discrimination-learning problems and, in a more general sense, to infer at least a possible relationship of this acutely disorganized reaction to the broader concept of experimental neurosis. Previously to Maier's demonstration of the occurrence of this behavior in the specific context of a no-solution problem-solving situation, many workers in psychology and biology had observed this acute reaction of the rat to loud environmental sound but had paid it scant attention. Immediately after the presentation of Maier's data, several investigators easily showed that a continuous airblast or other noise stimulation in the environment of the animal was sufficient to produce the disordered behavior pattern quite apart from any unsolvable learning task.

Curiously, in spite of the great amount of research time spent in the study of this reaction in the rat by psychologists, most of these observers, with one or two exceptions, have been very reluctant to consider the emotional aspects of this noise-induced convulsive and cataleptic sequence, and to conclude that the reaction has all the characteristics of an acute fright response. Instead, Morgan and Waldman (20) provided the term "audiogenesis," and thought of the etiology in terms of a sound-wave excitation of the brain. Smith (22) described the reaction as "audio-epileptic." Finger (10), after reviewing all the literature, wrote in 1944 that the abnormal behavior pattern induced by noise and considered first as another manifestation of experimental neurosis "quickly became a center of considerable controversy, from which the conclusion has gradually evolved that the pattern occurs as a relatively reflex reaction to direct sensory stimulation, (primarily of an auditory nature), and has little immediate significance for the study of 'conflict.'"

Certainly, these experimenters sought to save themselves from a possible anthropopathic fallacy in refusing to say that the rat can be frightened into disordered behavior. Yet, in these days of psychosomatic description in medicine the postulation that an acute fright state created by noise stimulation is associated with ultimately neurophysiologic changes which, in the rat, culminate in convulsive or subconvulsive and cataleptoid reactions of the nervous system should have been logically easy and scientifically profitable. The experimental creation in the laboratory of acute psychosomatic disorders is as necessary and as desirable as is the production of the more chronic behavior disturbance of experimental neurosis, or as is any possible demonstration that a neurophysiologic translation of intense sound wave excitation results in a disruption of the "electroneurophysiologic field."

It is a well-accepted psychologic fact that sudden noise is an universal stimulus (for many psychologists, the "unconditioned" stimulus) for evoking startle and fear. Such stimulation has electroencephalographically and electrocardiographically demonstrable repercussions in the rat. Lindsley, Finger, and Henry (16) reported that the onset of noise stimulation was accompanied by a five- to ten-seconds' suppression of normal corticoelectrical rhythm even in nonseizure animals. Whether sound-induced seizures occurred or not, heart rate changes were evident, sometimes manifest as a slowing and sometimes as an acceleration of rate. These observations are consistent with the conclusions that Gellhorn (2) arrives at for the autonomic phenomena accompanying the emotions of rage and fright, namely, that in these emotional states there is an excitation of the vago-insulin as well as of the sympathetico-adrenal systems.

Griffiths (3) has presented evidence to show that if rats can find a shelter, such as an artificially constructed rat hole, the incidence of seizures is markedly decreased. This indicates that psychological "hiding" from the threatening situation may protect the animal from the convulsive and cataleptic expressions of the fear reaction. Humphrey and Marcuse (9) discovered that by swinging the cage in which they were subjecting rats to noise-fright stimulation, the occurrence of the abnormal behavior disturbance was more certain than if the induction situation consisted of sound stimulation alone. The addition of another kind of threat, in the form of a swinging cage, increased, therefore, the seizure incidence.

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In several previous publications the writer has adduced experimental facts which further support the hypothesis that the abnormal behavior responses of the rat in the noise-fright situations represent an acute fear reaction which is associated with significant neurophysiologic disorganization. The relation of these symptoms of noise-induced disorder to the syndrome of "experimental catatonia," [1] which can be produced in the rat and other animals by a variety of agents, has also been stressed (1, 25, 26). Additionally, it has also been demonstrated that the motor expression of the noise-fright induced behavior pattern can be exactly reproduced by electricity applied in suitable tension to the rat's brain. Different kinds of stimuli, therefore, can evoke the motor pattern of the acute phase of the abnormal behavior disorder (24). Since it has also been shown that whether the motor aspects of the typical noise-induced behavior disorganization ensue after electric shock or whether a generalized "grand mal" convulsion is precipitated by electricity depends upon the intensity of the electrical stimulus, the typical noise-fright induced sequence is a reaction to a less intense stimulation than is necessary to produce a generalized "epileptic" convulsion. The ordinary noise-precipitated behavior disorder is, accordingly, a "subconvulsive" reaction. Occasionally, however, noise may produce a generalized convulsion as a part of the total acute sequence. This relatively rare latter occurrence is quite consistent with the experimentally demonstrated quantitative relationship between symptoms of "experimental catatonia" and the precipitation of generalized convulsions. As the intensity of the precipitating stimuli is increased by increasing the dosage of the various catatonizing drugs or by intensifying the anoxia, the manifestations of "experimental catatonia" give way to a generalized convulsion (1).

A comparison of the features of noise-induced abnormal behavior patterns with the characteristics of the electrically induced similar sequences shows certain very obvious differences. The noise-frightened rats display cataleptic symptoms for a much longer time than do the electroshocked rats. Other qualitative differences, such as a more excitatory reaction to stimuli, the occurrence of aggressive behavior like squealing or biting, and running away from the situation, all of which may characterize the resolution of the "catatonic" period following the electrically induced abnormal pattern and which are not seen in the postseizure state of the noise-frightened rats, point to a real difference between the electrically produced responses and the noise-induced disorder. The "catatonic" and cataleptic behavior of the noise-induced reaction lasts significantly longer, and there is no overt reaction to stimuli nor any aggressive or spontaneous withdrawal behavior manifest during the subsidence of the actual "catatonia." Indeed, the rat may not even react to painful stimuli for a long period of time following a noise-induced response.

When these animals are placed in an already familiar water-maze (27) immediately after the cessation of the hyperkinetic phase of the abnormal reactions, the noise-frightened rats show considerable neuromuscular dysfunction which, out of water, finds expression as catalepsy. Nevertheless, these animals attempted to move out of the start-box in the water-maze as soon as they were placed in it. The noise-fright situation, therefore, apparently engenders a fear and escape motivation which carries over into, or is reënforced by, the water-maze.

In general, then, it appears that the noise-fright reaction of the rat is associated with a fear-engendered neurophysiologic disorganization which is characterized by a hyperkinetic phase succeeded by a passive hypokinetic state which, in contrast to the electrically initiated and similar behavior, may be considered to have two components. One of these components is an actual neuromuscular dysfunction, attributable to the abnormal neurophysiology associated with the acute fear-escape emotion and motivation, and this is apparently reproducible by electrical stimulation of the nervous system. The other component is a generalized inhibitory state which is concomitant with and endures longer than the neuromuscular manifestations of the catatonia. This generalized inhibitory "post-traumatic" state may be considered the psychologic aftermath of the acute fear reaction and is the final phase of the psychologically continuous reaction to acute fear.

This generalized inhibitory state may be related to the phenomena of "sham death" or to the protective catalepsy of certain animals like the opossum, sheep, snakes, and turtles.

[1] There is no concern here with the theoretic implications of the concept "experimental catatonia." The term is used descriptively only in an effort to point out the similarity of the abnormal behavior disturbance of the rat, which so far had been evoked only in noise-fright situations, to behavior occurring in other kinds of animals and under other conditions. As a matter of fact, the substance of this publication makes it clear that "experimental catatonia" has different characteristics depending upon whether the "catatonia" is precipitated directly by electricity or whether it is induced by a noise-fright pattern of stimuli. From the theoretic point of view, the evidence presented here would indicate that the syndrome of experimental catatonia more closely adumbrates the psychopathology of traumatic neurotic reactions than the psychopathologic catatonic reactions of schizophrenia.

The noise-induced abnormal behavior disorder of the rat has no direct relationship, therefore, to experimental neurosis in the ordinary accepted meaning of this concept, but it may be considered an experimentally produced acute fright state. In view of the recent interest in the psychology of the soldier, the disorder might be evaluated as an experimentally induced disturbance with some of the psychosomatic implications of acute battle reactions. The possibilities for psychosomatic research of such a laboratory-induced behavior disturbance, particularly on the pharmacologic and neurophysiologic side, would seem to be important and fruitful.

Inasmuch as the responses of the autonomic nervous system to various pharmacodynamic substances have been fairly well studied, the use of certain drugs in the effort to influence the expression and occurrence of the noise-induced behavior disorder of the rat has considerable interest with reference to the relationship between the emotional state of the animal and the associated neurophysiologic disorganization. Practically all of the following studies have been directed to the one objective of determining whether the administration of certain pharmacologic agents increased or decreased the normally expected incidence of noise-induced disturbance. The results of the work of a number of investigators may be summarized as follows:

Drugs increasing seizure incidence	Drugs decreasing seizure incidence	Drugs not affecting seizure incidence
Metrazol (13, 18)	Atropine (8)	Ergotamine Tartrate [2]
Strychnine Sulfate (23)	Curare (16)	Phenobarbital (11)
Caffeine Sodium Benzoate (23)	Dilantin (21)	
Eserine (8)	Adrenal Cortical Extract (4)	
Nicotine (8)	Thiamin Hydrochloride (5)	
Coramine (29)		
Adrenalin (15)		

[2] During the time of some experimentation by the writer with the noise-fright reactions of the rat, Heath and Powdermaker (6) announced the use of ergotamine tartrate as a remedy for the "battle reactions" of soldiers. Its value for this purpose has not been confirmed, but since ergotamine tartrate possessed sympatholytic properties, these investigators felt that the use of the drug ameliorated the symptoms of the exaggeration of the normal responses of the sympathetic nervous system to fear, an exaggeration which they felt underlay the symptoms of battle reactions.

It was decided, therefore, to study the effect of the injection of ergotamine tratrate into the rat upon the incidence of the abnormal behavior pattern evoked in the standard noise-fright situation.

Result: It was found that the injection of from 0.1 mgm. to 1.0 mgm. of ergotamine tartrate subcutaneously or intramuscularly exerted no appreciable effect upon the noise-induced seizure-incidence.

Generally, a review of the pharmacologic experimentation with the noise-fright reaction of the rat indicates that those drugs which are associated with an autonomic nervous system excitability facilitate noise-fright seizures, and those drugs which tend to depress excitation of the autonomic neurophysiology may inhibit seizures. The rôle of the autonomic nervous system in the noise-induced behavior disorganization of rats, accordingly, appears to be significant.

It may be stressed again, therefore, that the abnormal behavior of the rat in the presence of a noise-fright situation represents an experimentally created acute fear-escape reaction which culminates in a generalized neurophysiologic disorganization. It is unnecessary to stretch credulity too far to see an analogy between this kind of behavior in the rat and some of the responses of human beings to battle stress.

Characteristic of the psychosomatic breakdowns resulting from the stresses of war are Torrie's (28) reports from the Middle East. He describes manifestations of anxiety panic by observing that "Witnesses gave details of purposeless behavior such as running around in circles, screaming, jumping out of slit trenches or staying in them long after danger was over." Mira (19) describes panic reactions to fear engendered under conditions of war in which movements of the utmost violence were seen and in which the "final motor storm was begun that sometimes gives rise to fits, at other times to catastrophic 'deflexes.'" Cataleptic reactions were ascribed by this same observer to what he called the sixth, or terror, stage of the evolution of fear. Tosquelles (19), Mira's pupil, found a lowering of the convulsive threshold to metrazol in all of his cases of traumatic war neurosis. Kardiner (12) has utilized the concept of "physioneurosis" to point to a syndrome of psychosomatic reactions to catastrophic environmental happenings in which a complex of autonomically mediated phenomena and epileptoid reactions are associated with the inhibitory handling of the responses to such happenings. His consideration is that somehow the autonomically mediated discharge of emotion occurs as the one mode of expression left available to the inhibited and "constricted" ego. However, Kretschmer (14), contrastingly emphasizing the released hyperkinesis of such reactions, had earlier written of these "violent-motor-reactions" as biologic defense-reactions which he considered as the prototypic reaction of hysteria.

Whatever constructs may be used to explain the actualization of neurophysiologic and general so

matic symptoms in association with psychologic reactions, one of the most pertinent areas of research is to study the immediate process of the translation of the psychology of the organism into the physiology of the organism. For the various reasons which have herein been detailed, the experimentally induced acute behavior disorder of the rat affords unusual laboratory opportunity for the investigation of this process of translation.

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CLINICAL NOTES

THE INTRAVENOUS USE OF SODIUM AMYTAL IN PSYCHOSOMATIC DISORDERS *

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The present report is based on experiences in administering relatively small doses of sodium isoamylethylbarbiturate (sodium amytal) intravenously to 500 patients in military and civilian practice, with bodily disorders related to problems of personality adjustment. The investigation was directed toward the evaluation of the usefulness and range of application of sodium amytal as an adjunct in the diagnosis, treatment, and the clarification of mechanisms of these bodily disturbances and diseases.

Bleckwenn (1, 2) first used the drug in 1930 in the treatment of psychoses. He induced prolonged sleep by the administration of relatively large dose. Later Lindemann (17, 18) reported experiments with small doses administered to psychiatric patients and normal individuals. During World War II there developed in the military services a widespread interest in sodium amytal intravenously administered as an aid to diagnosis and treatment of neuroses (9, 11, 16, 20, 21, 26, 30). Data concerning the value of narcoanalysis in psychiatric practice have been summarized by Horsley (14).

The most prominent effects of the drug have been shown to be exerted on the central nervous system (14, 17, 18, 24, 27, 30). They are manifested chiefly by a change in the mental state of the subject, characterized by drowsiness, euphoria, detachment, and willingness to discuss intimately personal matters.

Other manifestations of altered neural functioning which have been commonly observed following administration of sodium amytal are nystagmus, vertigo, staggering gait, dilated pupils, decreased corneal reflexes, and diminished reactivity to painful stimuli. Wolff and Gantt (32), in experiments on dogs, found that small or moderate doses of sodium amytal did not abolish unconditioned or inborn reflexes but raised the threshold of the highest integrative functions, accentuated primarily the effect of threshold-raising stimuli and lessened the effect of threshold-lowering stimuli. Headlee and Kellogg (12) found that after hypnotic doses of nembutal conditioning was possible in dogs but was less efficient and proceeded at a more depressed level than in the normal state.

Thoerner (28), from observations on the psychologic and neurologic changes in man during gradual increase in the concentrations of sodium amytal in the blood, concluded that the various divisions of the nervous system are affected in the order of their phylogenetic appearance, the latest being the most readily affected. In contrast, Keeser and Keeser (15), in experiments on the distribution of drugs in the central nervous system of animals, found that after the injection of small doses of barbiturates specific cells of the diencephalon had a characteristic affinity for the drug.

In encephalographic studies Conn and Katzenelbogen (6); Rubin, Malamud, and Hope (25), and Brasier and Finesinger (4) found fast frequencies resulting from the injection of sodium amytal. The latter authors reported that the high voltage, fast activity appeared first in the frontal leads, then in the parietal leads and finally in the occipital leads, and that it disappeared in the reverse order.

Other pharmacologic effects, such as dilation of blood vessels (10), lowering of blood pressure (3, 7, 29), fall in body temperature (7), slight increase or decrease in pulse rate (3, 29), variable effects on the basal metabolic rate (7), reduction in the calcium content of plasma (5), and inconsistent changes in the sugar and chloride levels of the blood (5, 24) may be secondary to the action of sodium amytal on the highest integrative functions. Diethelm, Doty, and Milhorat (8) reported that the emotional changes occurring under the influence of sodium amytal were associated with changes in substances in the blood which affect the contractions of isolated strips of rabbit intestine. Quastel and Wheatley (22) and Quastel (23), who experimented on guinea-pig and human brain tissue in vitro, found diminution in the oxygen uptake in the presence of barbiturates. They considered this action to be due to adsorption of the drug upon specific areas of nervous tissue, thus diminishing the ability of the cells to activate lactic and pyruvic acids.

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METHOD

Sodium amytal was administered intravenously to a group of 500 patients with bodily disturbances thought to be related to problems of personality adjustment. Four hundred of these patients were seen in an Army hospital and 100 in civilian practice. Approximately two-thirds of the patients were hospitalized and one-third were seen as out-patients. An amount of the drug sufficient to cause drowsiness and relaxation but not large enough to cause sleep or anesthesia was given. Response to painful stimuli as indicated by reactivity to light pin prick was not abolished. The dosage required varied between 0.1 gm. and 0.8 gm. A 10 per cent solution was injected at the rate of not more than 0.1 gm. per minute according to the method advised by Lindemann (17, 18). The maximum action as indicated by relaxation, loss of inhibitions, and symptomatic improvement was observed to occur during the ten-minute interval after the injection of the drug was stopped. The action then gradually diminished so that, in most cases, by the end of three hours there remained little subjective or objective effect. No serious complications were encountered.

While he was under the influence of the drug the patient was asked simply to verbalize his thoughts without specific questioning. This free association method often quickly revealed the individual's most significant conflicts. The patient was next questioned about relevant data which had been previously discussed with him in the preliminary history or during narcoanalysis. Interviews usually lasted from one to two hours.

While he was under the influence of the barbiturate the patient's problems were discussed and formulated with him and suggestive therapy was often given. It was found that after twenty-four hours individuals varied greatly with regard to their ability to recall details of the discussion during the narcoanalysis. Accordingly, in subsequent interviews caution was exercised by the physician in relating repressed conflicts to the patient in order to avoid severe anxiety or depression. Such undesirable developments were successfully avoided by dealing first with less fundamental conflicts and cautiously adding questions which might induce the patient to recall elements of the more significant ones. Whenever evidences of undue anxiety or depression were observed the discussion was not pushed further at that session, the patient being diverted and reassured instead.

OBSERVATIONS

A. DIAGNOSIS

I. Distinction Between Structural and Functional Disease

In certain cases it was possible to obtain information while the patient was under the influence of sodium amytal which decisively distinguished functional from structural central nervous system disease. Such usefulness was illustrated by the case of a 36-year-old Army Captain who complained of intense occipital headache, a disturbance in gait in which he drifted toward the left, and weakness of the left arm and leg. Physical examination revealed marked stiffness of the neck, drifting to the left, awkward performance of fine and alternating movements by the left arm and hand, increased resistance to passive stretch in the left arm and leg, and diminished sensation to pin prick in the left leg. This patient had been considered to have a posterior fossa tumor. After administration of sodium amytal he became well relaxed, and all of the above evidences of neurologic disturbance disappeared.

Another patient, a malnourished survivor of three years of imprisonment in a Japanese prison camp, gave evidence of complete loss of sensation in the legs, associated with weakness. This had been attributed to a dietary deficiency, until the manifestations disappeared temporarily under sodium amytal. The patient has been discussed in detail in another report (31).

In five cases of pseudoparkinsonism, beginning in the setting of exposure to heavy enemy gunfire or bombing, there was a dramatic disappearance of the rigidity and tremors while the patients were under the influence of the drug.

In most cases in which a diagnosis of post-concussion syndrome had been made, headache disappeared after sodium amytal was given. A lieutenant colonel in the infantry, who five months previously had been knocked momentarily unconscious when hit by a shell fragment, and ten days later had a similar reaction when blown out of his foxhole by a Japanese mortar explosion, complained of frequent severe occipital and right temporal headaches. His headache, present at the time of injection, disappeared immediately after sodium amytal was given. He said that his headaches had begun over a month after his second period of unconsciousness at a time when he was making plans which involved the lives of thousands of men. The headaches repeatedly recurred at times when he was working in a blackout

tent on details of the next day's strategy. He said "I was unsettled inwardly when I was outwardly as cold as ice."

In contrast, another infantry officer complained of a similar type of headache and in addition displayed evidence of difficulty in concentration and memory on special testing. His headache and thinking difficulty were unaltered after he was given sodium amytal and thus he appeared to be one of the few patients in whom structural changes might have been involved in a post-concussion syndrome.

In three instances, persistent urinary retention, which previously had required catheterization, was relieved promptly after intravenous injection of sodium amytal, from 1100 to 1800 cc. of urine being voided by the subjects.

On rare occasions symptoms remained unchanged or became more severe after injection of sodium amytal. A young pilot, who had pain, weakness, and sensory loss of an hysterical type in his right arm and hand, spoke spontaneously, while under the influence of the drug, of the horrors of having his friends shot down and of the failure of his fiancée to write to him. He insisted that his hand was incapacitating and, indeed, on examination his weakness was more pronounced and the sensory loss more widespread than it had been before injection of the drug. Subsequently, however, after approximately three weeks of psychotherapy the patient's disability disappeared completely.

Patients with tinnitus and deafness showed marked symptomatic improvement after sodium amytal. A soldier who had been a radio and switchboard operator had had a sensation "like air rushing past the ear drum" and partial deafness intermittently for one year. While under the influence of sodium amytal his troublesome sensations disappeared and his hearing became normal; he spoke of being fearful of participating in the next invasion.

In subjects with tinnitus secondary to otosclerosis and other structural ear disabilities no change in the symptom occurred following injection of sodium amytal.

The differential diagnosis of chorea was often clarified following intravenous injection of sodium amytal, as exemplified by the following case history.

A 29-year-old woman began to display adventitious movements at the age of 3 following a surgical operation for knocked knees. The movements were choreiform in type, irregular and jerky, involving the head and extremities. They were not present during sleep but she was rarely free of them when awake. Otherwise she appeared cheerful and composed, and denied significant conflicts. As soon as the sodium amytal injection was begun she lost her choreiform movements and they remained absent for the rest of the day. She spoke of intense feelings of insecurity and conflict regarding her relations to her brother and husband. It became clear that she was suffering from an hysterical neurosis manifest by choreiform movements.

Sodium amytal in other cases was of help in making or substantiating a diagnosis of structural disease. A 60-year-old elevator operator, who showed diffuse choreiform movements as well as evidences of personality change, had been thought to have hysteria. After being given sodium amytal, abnormal muscular movements were accentuated instead of relieved. During the interview, unlike the rigid hysterical patients whose disabilities became more marked, he gave evidence that his emotional conflicts were secondary to his difficulty in carrying on in the face of his handicap of chorea and impairment of thinking. Further study revealed that he was suffering from Huntington's chorea.

The diagnosis of the cause of low back pain, so commonly encountered in the Army, was clarified by the use of the drug in numerous cases. One such soldier, whose painful back was rigid and inclined forward at the hips, complained of severe pain in the lumbar region and became tearful when an effort was made to induce him to bend. Under amytal his spastic lumbar muscles relaxed and his back became supple and painless. While under the influence of the medication he expressed resentment toward the Army and an enthusiastic interest in his Arkansas farm. During a further ten-day period of observation he remained asymptomatic. In the case of another patient, who gave a history of back strain, the pain and disability were relieved but not abolished by sodium amytal. Further study of this man indicated that the pain of muscle spasm in a setting of tension and conflict had become superimposed on symptoms due to a mild back injury.

Comment: The above typical case histories illustrate the value of sodium amytal not only in distinguishing between structural and functional disorders but also in evaluating defects upon which were superimposed functional disabilities related to situational conflicts.

II. Distinction Between Functional Disorders and Malingering

The intravenous administration of barbiturates has been noted by others to be helpful in uncover-

ing malingering (19, 21). This use was dramatically illustrated by the case of a 23-year-old private in the infantry, whose early development was marked by nail biting, bed wetting, crying spells, and fainting attacks. While in high school his left leg had given way during a football game and as a result he was placed in a plaster cast. Subsequently he went about on crutches for a few weeks. His present difficulties began while convalescing in the hospital from an attack of hepatitis. He suddenly complained that his left leg had become so weak and painful that he was unable to walk. Neurologic examination showed normal reflexes and sensation. During the administration of sodium amytal he bragged about his bravery. Five minutes later, however, he burst into tears, confessed that he had been faking his leg trouble since his high school days and said that he had had fears all his life. "I can't stand to kill, and I can't kill any more. I had to get out of there to a safer place, and I had to fake something to keep from going back for my mother's sake." Following this interview he was able to walk without difficulty.

A sergeant in the artillery complained of failing vision after running into a camouflage pole in a combat area. He stated that he was constantly preoccupied with the hope of getting well and returning to his unit. The ophthalmologist could find no explanation for his defective vision. After being given sodium amytal he became well relaxed and gave inconsistent answers to visual tests. When his inconsistencies were pointed out to him he seemed evasive. He was told that he appeared to be unconsciously misrepresenting the facts and that he would be returned to duty after a further brief period of hospitalization. Several days later he voluntarily confessed that he had invented his eye symptoms to evade the dangers of combat.

III. Uncovering of Psychoses

In some patients in whom the diagnosis was obscure sodium amytal was helpful in revealing the illness as psychosis.

A young soldier, who complained of sensations as though all the heat in his body were rushing to his head, and a "weak, nervous feeling" in his back, became disorganized in his thinking after receiving sodium amytal and had visual hallucinations, chiefly of Christmas packages floating through the air. A presumptive diagnosis of schizophrenia was then made and later confirmed by the further course of his illness.

Another soldier who suffered from malnutrition and constriction of his visual fields following three years of imprisonment by the Japanese had shown no psychotic manifestations during a ten-day period of observation in the hospital. While having the purpose of the sodium amytal injection explained to him, he became suspicious and reluctant to receive the drug. After injection his visual fields became normal but he displayed scattered talk and bizarre behavior characteristic of schizophrenia. Further history obtained from fellow prisoners revealed that he had had severe psychotic symptoms during captivity and had been confined to the disturbed ward for six months.

IV. Clarification of the Mechanism of Action of Sodium Amytal and of the Physiology of the Disturbances Manifest by the Subjects

Most subjects, following injection of sodium amytal, reacted with bodily relaxation and an attitude of freedom from anxiety similar to that following ingestion of alcohol or inhalation of ether. In some, however, bodily tension increased, affect intensified and troublesome symptoms appeared or became accentuated.

In those with suppressed or repressed conflict the source is often brought to the fore accompanied by an appropriate affect of anxiety or depression. With the change in (personality) reaction there was frequently observed an alteration in physical manifestations. In certain conditions, such as migraine, asthma, and hypertension, the signs and symptoms have disappeared while the patient is under the influence of the drug. In a number of these patients, while still under the influence of the drug, the manifestations have reappeared during discussions of problems which have caused emotional conflict. Characteristic examples will be found among the following cases.

1. *Convulsions:* A soldier was under observation because of convulsions of obscure nature. He said that he was constantly fearful that he would develop a "fit" when other people were around. He showed an excessive body preoccupation and gave a history of many somatic symptoms which appeared to be hysterical in type. Three minutes after the effect of the drug was noted he became very tense, writhed on the table, and said that he was having a typical "convulsion." He clutched his throat, stated he could not speak, and told of feeling frustrated in his ambitions and fearful of losing his mind.

2. *Migraine:* A 38-year-old business man, who had had classical attacks of migraine since the age of 7, told of numerous situational conflicts, chief of which involved the domineering attitude of his

parents, wife, and in-laws, his failure to achieve success commensurate with his education and equal to that of many of his contemporaries, his need for affection which had frequently been denied by his parents and wife, and a fear of a reactivation of tuberculosis for which he had been treated in a sanitarium for a year at the age of 26. He was given sodium amytal while he was having a severe, unilateral, throbbing headache, accompanied by nausea. Five minutes after the injection he was well relaxed, symptom-free, and talking jovially about neutral topics. A few minutes later his in-laws were introduced into the discussion. He promptly expressed resentment and headache of lesser intensity returned. When the topic was changed again, however, to his keen interest in baseball, the pain again subsided.

3. *Hypertension:* The level of blood pressure after injection of sodium amytal showed considerable variation in individual cases. Most commonly it was lowered. In many cases of hypertension normal blood pressure levels were recorded while the patient was under the influence of the drug. In some there was no change. In experiments on other patients an initial lowering was followed by a rise in level when sensitive topics were discussed. This type of reaction was illustrated by the case of a 39-year-old man who was irritable, excessively attached to his mother, maladjusted in marriage, and unstable in his work record. Prior to the administration of sodium amytal his blood pressure was 164/120. After the drug was given he showed a general bodily relaxation and his blood pressure fell to 130/90. He became resentful when discussing an experience in which a woman took his seat in a bus and his blood pressure rose to 140/100. Later, with relaxation, it fell again to 130/90.

4. *Asthma:* An example of the response of the bronchi under sodium amytal is provided by a 19-year-old hospital laundry worker who was excessively attached to his widowed mother and repeatedly had developed marked difficulty in breathing with wheezing when under stress. When the patient was 17 his father died suddenly of a heart attack. At that time the patient was in bed with a severe attack of asthma. When he learned of his father's death his symptoms quickly subsided and did not recur until over six months later, after his induction into the navy. At this time he felt homesick and was having difficulty in adjusting to the routine of navy life. During a moderately severe attack of asthma the patient was hypnotized and suggestion was offered that his symptoms would improve. Dyspnoea and wheezing diminished greatly. He then began to discuss his fear that his mother might die. Suddenly, his asthmatic symptoms became much more severe. When a neutral topic was introduced symptoms again subsided. On another occasion, with the aid of sodium amytal instead of hypnosis, it was found possible to abort a moderately severe attack of asthma.

A 26-year-old orthodox Jew, who was a fur dealer, had had numerous attacks of bronchial asthma which were not associated directly with contact with fur, though he showed skin sensitivity to various danders. He was given sodium amytal on a day when he had been free of symptoms for a week. While under the influence of the drug, audible wheezing developed when he spoke of his father's death and feelings of guilt because he had not observed a year of mourning.

In contrast to these cases, another individual, a 24-year-old bus driver, suffered severe bouts of asthma in connection with and apparently mainly related to recurrent episodes of pneumonitis. He was given sodium amytal during an attack of moderate intensity, without change in his signs and symptoms.

5. *Nasal Disturbances:* In individuals subject to vasomotor rhinitis and other types of obstructive nasal disease, the erectile tissues of the turbinates and nasal mucous membranes could be made to either shrink or become engorged during suggestion under the influence of sodium amytal. An example of the latter process is quoted.

A 40-year-old itinerant salesman had noted recurrent nasal obstruction and rhinorrhoea beginning at the time of a business failure in a small retail enterprise shortly after his marriage fourteen years before. He blamed the failure on his wife since she declined to work with him in the store. The nasal condition partly subsided after a few months and flared up again two years later when his wife insisted on buying furniture with $800.00 which he had saved to start another store. Again his symptoms recurred the following year when his wife underwent a costly pelvic operation which rendered her sterile. Her failure to become pregnant had always been source of great disappointment to the patient. Once in 1935 he left her for a few weeks but returned "because I missed the comforts of home. We never got along but she was a good cook and a good housekeeper." From that time on his nasal complaints became chronic, never severe, but moderately troublesome most of the time, with frequent nose blowing and intermittent partial obstruction.

During an interview under sodium amytal when

he was reminded of his wife's lack of devotion he became angry and resentful. Concomitant with these feelings, his nasal membranes, previously of normal appearance, became hyperaemic and finally hypersecretion and obstruction to breathing were noted. These changes subsided later when the patient was reassured and diverted.

6. *Coupling of Nasal Disease with Asthma:* A 36-year-old Russian Jewess had married, fourteen years before, a Roman Catholic, in defiance of her parents' wishes. She had hoped that her husband would achieve economic success and thereby vindicate her position, but shortly after their marriage he obtained a job with the city of New York as a garbage truck driver and insisted on keeping to the job on the grounds of the security it offered. Accordingly the patient shifted her aspirations to her children. Her nasal obstructive symptoms began when her oldest child was found to have diabetes. Her asthma appeared nearly two years later when the second child began to complain of identical symptoms. On three separate occasions under the influence of sodium amytal it was possible either to induce nasal hyperaemia and obstruction coupled with a typical asthmatic attack characterized by dyspnoea and wheezing, or to cause such an attack to subside. The difference in effect depended upon whether the physician's attitude and conversation involved reassurance and divertisement or a threat to the patient's security in the form of unsympathetic discussion of her problem (12).

B. THERAPY

Individuals with pains of undetermined mechanism, usually in the back or abdomen, comprised the largest group successfully managed with the aid of sodium amytal. Most of the pains disappeared, temporarily at least, under the influence of the drug.

Information gained about the psychodynamics of the illness was inevitably helpful in treatment. Problems recalled under the influence of the drug served as a basis for further analysis of emotional conflicts and personality reactions in subsequent interviews. The demonstration to the patient of symptomatic change was found helpful in breaking into a more or less fixed reaction pattern, and in making clear to him that the symptoms could be altered or dispelled. In order to promote the prolongation of symptomatic improvement while the effects of the drug were disappearing, in the case of in-patients the nursing staff was instructed to keep the patient awake during the rest of the day, reinforcing suggestion which the physician had given. This device was particularly useful in preventing relapses in individuals with hysteria. Those whose conversion symptoms were replaced by moderate anxiety or depression became more accessible and amenable to treatment.

From the study of the diagnostic and therapeutic use of sodium amytal it is clear that the drug itself should not be considered a specific agent but rather as a tool to induce in the patient a special state. The part played by the physician during the sodium amytal interview is essential to the proper use of the drug. Many of the patients discussed above showed common reactions in which there was therapeutic benefit as well as clarification of the mechanisms of the illness. Additional case examples will further illustrate its value in therapy.

The following case history shows how sodium amytal may be useful in obtaining information which could not be divulged in the normal state and which was useful in treatment. A 21-year-old soldier showed much anxiety and tension and expressed concern about an excessively close attachment to his younger sister. On two occasions he had sought out the physician in order to discuss another problem which had been preying on his mind. Each time he was unable to talk freely and became very tense. After being given sodium amytal he spoke of having homosexual relations at the age of 15 and on five occasions with a man in his organization after coming to an isolated post on a Pacific island. He felt that being in a situation where there were no girls had increased his homosexual tendency. He recounted both heterosexual and homosexual dreams. Later he had no recollection of the data given under the influence of the drug. When he was told what he had said he felt considerable relief because he had felt a great need to unburden himself to some one. Although he improved it was decided that he should be returned to the United States so that it would be possible for him to associate with girls. The subsequent course during the year and a half after he had returned to this country indicated a marked improvement in his adjustment. He associated with women and lost most of his homosexual desires. He finally married and made a satisfactory sexual adjustment with his wife. Anxiety and hysterical symptoms disappeared.

Several frigid women showed marked increase in sexual satisfaction after a single sodium amytal interview. One 33-year-old woman who had been married for twelve years had fallen in love with another man while her husband was overseas. She

had great difficulty in talking freely during interviews. After being given sodium amytal she spoke of her husband being repellant to her when he returned and of feeling great guilt because of her extramarital affair. She was reminded by the physician of her husband's assets and encouraged to forget the other man. After the interview she felt more at ease and during the following week she had satisfactory intercourse with orgasm on three occasions. Later she again had a brief period of loss of sexual feeling. After subsequent psychotherapeutic interviews she developed more affection for her husband and more nearly complete satisfaction in her sexual relationship.

In patients who were convinced that their predominant symptoms were due to permanent injury or structural defects the demonstration of their functional nature was frequently of benefit. An infantry lieutenant who had taken part in rigorous combat sustained superficial injury to his corneae from shrapnel. This was followed by a period of complete blindness lasting about ten days, and then partial recovery of vision which was nevertheless insufficient for him to return to combat. By this time his corneal wounds had healed without scarring. After he was given sodium amytal his vision returned to normal. He talked at length of his horrifying experiences and the deaths of several close friends. After the treatment he continued to have normal vision but had periods of anxiety and depression which eventually were treated successfully by psychotherapy.

This patient illustrates the importance of treating an illness as a whole and the fallacy of considering an individual rehabilitated as soon as a symptom, such as a visual defect, was corrected with the aid of sodium amytal.

DISCUSSION

That the intravenous administration of barbiturates has little if any direct effect on the peripheral, neural, or vascular mechanisms is attested to by the fact that changes in either direction or no change at all have been found in the pulse, blood pressure, body temperature, basal metabolic rate, blood sugar content, and other constituents of the blood. It has been shown that the barbiturates do not raise the pain threshold or otherwise interfere with the propagation of painful impulses in the conscious subject (33). On the contrary, available evidence indicates that the drug in clinical dosage acts chiefly or only on the highest integrative functions and through them on the rest of the organism. The results of these effects are observable in the individual chiefly as a general relaxation with a sense of well being, a decrease in inhibitions and a willingness to discuss intimately personal topics with less reluctance than usual.

In over 90 per cent of the patients examined information which had previously been repressed, suppressed, or voluntarily withheld was revealed. Although most of the data discussed during narcoanalysis was factually accurate, phantasies were sometimes recounted. In a few patients facts were voluntarily misrepresented. Deliberate lying could often be detected not only from the inconsistency of statements but also from the manner in which the false statements were made. Usually the subject's speech was overly precise and his statements were unaccompanied by appropriate affect. Often he refused to enlarge on laconic answers to questions.

A type of psychologic change, similar to that which occurs after injection of sodium amytal, has also been observed during alcohol or ether intoxication. In this state a subject is likely to provide the examiner with important data concerning the background and dynamics of his illness. After the effects of the drug have disappeared the individual usually has but a hazy recollection of the data discussed and his insight into his condition may not be increased. However, the physician may gain understanding of the psychodynamics in a short time. This knowledge, which he otherwise might not achieve for weeks or even months, can be used by him in introducing topics for discussion which, in turn, may lead to an improved insight in the patient as well.

Subjects under the influence of sodium amytal are usually in a highly suggestible state, similar to that induced by hypnosis, and often therapeutic use may be made of this state as is done with hypnosis.

In treatment sodium amytal was of greatest aid in those whose illnesses were of relatively short duration and in whom the dynamic factors could be readily identified. Those with chronic conditions in whom the dynamics were more obscure, on the other hand, responded less well. The drug was especially valuable during the war in the treatment of disorders which developed in combat or were precipitated by other severe environmental stress. In such individuals not only could the factors of battle stress be elucidated but in addition significant data about pre-existing personal problems which seemed to increase the individual's susceptibility to illness became accessible and could be utilized in treatment.

Circumspection was used by the physician in recounting to the patient information obtained during

narcoanalysis in order to prevent the development of severe anxiety or depression.

Whether or not a patient's symptoms were altered during the sodium amytal interview was of prognostic significance with regard to ultimate recovery, as was their degree of accessibility under the drug. Those patients who were influenced symptomatically by the drug and who discussed topics about which they were sensitive most freely were more likely to recover than individuals whose symptoms failed to be altered and who were not able to unburden themselves under the influence of the drug. Such rigid personalities were found to be less amenable to other forms of treatment as well.

The condition of the narcotized patient was found to be additionally useful in investigating the mechanisms of various bodily disorders. Under sodium amytal the subject's attention could be readily monopolized by the examiner and his thoughts focused. Thus, the situation could be freely manipulated and the suggestible patient could be made either relaxed and secure or tense and anxious. Among individuals reported in this communication it has been possible by thus manipulating the situation to accentuate or diminish, at will, the contractile state of blood vessels and bronchi as well as the functioning of other bodily structures. Such experiments have served to demonstrate that the bodily disturbances involved in essential hypertension, migraine, vasomotor rhinitis, asthma, and other conditions, with their accompanying alterations in emotions or feeling states, occur as part of a biologic reaction of the human organism to life situations.

SUMMARY AND CONCLUSIONS

1. The action of intravenously administered sodium amytal in 500 patients in military and civilian practice has been analyzed from the standpoints of its usefulness in diagnosis, treatment, prognosis, and investigation of etiology of bodily disorders arising from problems of personality adjustment.

2. The drug has been found useful chiefly as follows:

I. Diagnostically,

a. In distinguishing between irreversible, structurally determined disorders and functional disorders of organ systems.

b. In distinguishing between neurosis and malingering.

c. In the elucidation of dynamically significant situational conflicts.

II. Therapeutically,

a. In the alleviation of troublesome symptoms.

b. When data obtained during sodium amytal interview was used in formulation to the patient or when the reassuring value of the reversibility of symptoms was used, or in the use of hypnotic or post-hypnotic suggestion.

III. Prognostically, in determining the depth of a disturbance and its susceptibility to treatment.

IV. From an investigative standpoint in rendering modifiable the bodily disturbances of various diseases.

3. The most suitable subjects for narcoanalysis by means of sodium amytal are those with disorders of personality adjustment of relatively short duration. The drug is less useful in diagnosis or treatment of patients with rigid personalities or long-standing patterns of disability.

4. Sodium amytal is a highly useful tool in medicine but it is in no sense a specific or automatic agent. It is only of substantial value in the hands of an appropriately skilled physician who utilizes the state which the drug induces to gain diagnostic or therapeutic leverage.

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FLICKER FUSION FREQUENCY AS A FUNCTION OF ANXIETY REACTION; AN EXPLORATORY STUDY *

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The ability to perceive a certain number of visual stimuli per unit of time has been found to differ significantly between hypothyroid patients and normals (3), between older and younger persons (1, 2), between fatigued and rested truck drivers (5), etc. In all such cases, the number of light-dark cycles per second at which a physically intermittent light was just perceived as a steady light was found to be lower for the more fatigued cases or those with lower metabolic rates than for normals or rested persons.

If it is shown that this variable clearly differentiates between normals and any clinically diagnosed psychoneurotic group, then flicker fusion frequency may be useful for measuring, more or less roughly yet objectively, the degree of disturbance possessed by various individuals, not only at the time of the original diagnosis but also at various stages of therapy as a check on the progress of therapy.

This question was formulated in response to a military assignment involving the study of a neuroticlike syndrome exhibited by many of the Army Air Forces combat veterans after their return to the United States. This syndrome was officially designated as "operational fatigue" and is described elsewhere very ably by Grinker and Spiegel (4). Insofar as this syndrome was, on the surface, characterized chiefly by indications of severe hypertension, we shall refer to it simply as anxiety reaction. It should be noted that this reaction may be understood as normal in response to the combat situation. It is described as a neuroticlike syndrome only with reference to those for whom the reaction persisted, and in some cases became intensified, in postcombat life.

It was this group of aircrew returnees who served as the experimental group for our study of flicker fusion frequency. All testing was conducted at Army Air Forces Redistribution Station No. 2, Miami Beach, Florida.

PROCEDURE

Fifty normal aircrew returnees and 50 anxiety reaction cases were selected, from 1 June until 23 June 1945, to report for a flicker fusion test.

1. From those returnees who were referred for psychiatric examination (approximately one-half the total processed at Station No. 2) during the course of routine medical processing, the psychiatrists selected 50 experimental cases showing fairly severe anxiety reactions.

2. From those returnees who were not referred for psychiatric examination, the medical officer at the final check station on the medical processing line selected 50 control cases.

3. Two testing conditions (A and B) were used, and the composition of the several groups of subjects was as follows:

	Condition A		Condition B	
	Officers	E. M.	Officers	E. M
Control cases	16	9	19	6
Anxiety reaction cases	8	17	12	13

The apparatus used in this study was a General Radio Company "Strobotac," Model 631-B, which is capable of producing a variable oscillating light with a range of 600 to 14,500 cycles per minute. Because of certain extraneous light fluctuations which it was desirable to minimize, the apparatus was modified in the following manner:

1. The 5″ diameter of the light source and reflector was cut down to 1¾″ by placing an opaque cardboard shield in front of the apparatus. A circle of 1¾″ diameter was cut out of the shield.

2. A single sheet of white bond paper was fixed to the back of the cardboard shield and acted as a translucent screen between it and the apparatus.

3. A fixation point on the shield was provided by drawing a cross with axes ⅛th of an inch long which intersected at a point 2″ below the center of the stimulus light.

The physical characteristics of the test room situation were as follows:

1. The test room was 9′ high by 9′ wide and 11′ long. Blackout curtains cut off all light from windows.

2. The apparatus was placed against a wall 9′ wide, and equidistant from either side. A 7′ wide portable movie projector screen was placed against the wall and behind the apparatus, in order that the background of reflected light would appear standard when the subject faced the apparatus.

3. Each subject was seated in such a manner that his eyes were level with the center of the

* This study was carried out as part of the Army Air Forces Aviation Psychology Program.

** Columbia University.

stimulus light, and 24 inches distant. This distance insured a 5 degree angle of vision when the subject fixated on the cross 2 inches below the center of the stimulus light. Vision was binocular.

4. The room was lighted by a 50-watt, 120-volt, G. E. Mazda lamp located in the center of the ceiling.

5. A General Electric fan effectively screened out sounds produced by the Strobotac motor and in this way completely eliminated possible auditory cues.

Upon entering the test room, the subject was seated, facing the apparatus. At this point a three-minute period, timed with a stopwatch, was given for the purpose of light-adapting the subject to the illumination level of the test room. During this three-minute period, the following data were recorded:

1. Time of day.
2. Age of subject.
3. Estimated visual acuity (by subject).
4. A short description of any strenuous exercise indulged in on the day of testing (*e.g.*, physical training).
5. Estimated hours of sleep on previous night.
6. A short description of any drinking (alcoholic) which might have taken place on the night prior to testing.

Standardized directions were read to the subject and ten measures of flicker fusion frequency were taken. These were separated by fifteen-second rest periods, during which time scores were recorded. The stimulus light was turned off as soon as the subject made a response, and turned on again five seconds before the start of the next trial.

1. For the first 50 subjects (25 control and 25 experimental), scores were obtained by beginning with a frequency of 3,700 per minute and gradually diminishing the frequency until the presence of flicker was reported. For the second group of subjects, a frequency of 2,000 per minute was used at first, and gradually increased until the absence of flicker (flicker fusion) was reported. Although the second method is the traditional one, it was felt worthwhile to try both. These two methods are referred to as Conditions A and B.

2. The frequency of the stimulus light was controlled by a hand-operated dial. The rate at which this dial was turned was subject only to the very rough kind of standardization afforded by kinaesthetic control on the part of the examiner. The examiner looked away from the dial, the frequency scale and the subject during the progress of each test trial in order that kinaesthetic control should not be influenced by what could be seen.

RESULTS

In Table I a statistical summary of the results is presented for each of the two testing conditions.

TABLE I

BASIC STATISTICS FOR TWO METHODS OF MEASURING FLICKER FUSION FREQUENCY

	Condition A Fusion to flicker		Condition B Flicker to fusion	
	Control (N = 25)	Experimental (N = 25)	Control (N = 25)	Experimental (N = 25)
	Cycles per minute		Cycles per minute	
Mean	3416	3248	2736	2613
S. D.	125	167	160	158
	Fishers "t" = 3.93 *		Fisher's "t" = 2.69 *	
	r_{bis} = .62 **		r_{bis} = .45 **	
	S.E. r_{bis} = .13		S.E. r_{bis} = .15	
	r^c_{11} = .98 ***		r^c_{11} = .96 ***	

* Difference between the means significant at the 1% level or better.
** Correlation between flicker fusion frequency and psychiatric diagnosis (presence or absence of operational fatigue).
*** Corrected for twice the length by use of the Spearman-Brown formula

TABLE II

VARIABLES FOR WHICH INTERCORRELATIONS WERE COMPUTED

1. Flicker fusion frequency
2. Psychiatric diagnosis
3. Hours of sleep
4. Time of day tested (hours since 0001)
5. Age
6. "Alcoholism" *

* For this variable the sample was split into those who drank more, and those who drank less, than one bottle of beer on the previous night.

It is apparent that the mean scores made by normals are significantly higher than those made by anxiety reaction cases, though there is considerable overlapping of the distributions. It is also evident that results for testing Condition A (fusion to flicker) seem to be somewhat more related to anxiety reaction diagnosis than the traditional testing condition, Condition B (flicker to fusion).

In order to evaluate the extent of the relationships between anxiety reaction and fusion frequency, it was considered desirable to determine the relationships between fusion frequency and some of the other variables in the test situation that might conceivably have affected the test scores. The intercorrelations of these variables and those of fusion frequency and psychiatric diagnosis are presented in Tables II and III. Visual acuity and physical exercise are omitted because no distribution was

obtainable (all subjects reported 20/20 vision and no exercise on the day of testing).

The intercorrelation tables suggest that flicker fusion frequency is not significantly related to any of the variables studied except that of pyschiatric

TABLE III

INTERCORRELATIONS: CONDITION A (N = 50)

	1	2	3	4	5	6
1	—	.62 *	—.06	—.41 **	.01	.22
2	bis	—	.33 *	—.44 **	—.05	.60 *
3	pm	bis	—	.10	—.14	—.09
4	pm	bis	pm	—	—.11	—.08
5	pm	bis	pm	pm	—	—.06
6	bis	tet	bis	bis	bis	—

* The variables are so defined that these positive correlations indicate that normals slept more, drank more and got higher scores than the operational fatigue cases.
** Fatigue cases tended to report later in the day.

INTERCORRELATIONS: CONDITION B (N = 50)

	1	2	3	4	5	6
1	—	.45 *	—.04	—.09	—.05	—.14
2	bis	—	—.19	—.09	.50 *	—.20
3	pm	bis	—	.11	—.19	—.24
4	pm	bis	pm	—	—.24	.13
5	pm	bis	pm	pm	—	.07
6	bis	tet	bis	bis	bis	—

* The variables are so defined that these positive correlations indicate that normals were older and got higher scores.

TABLE IV

CORRELATION BETWEEN FLICKER FUSION FREQUENCY AND PSYCHIATRIC DIAGNOSIS WITH COMBINATIONS OF CERTAIN VARIABLES HELD CONSTANT *

Coefficients	Condition A	Condition B
$r_{12\cdot3}$	.68	.45
$r_{12\cdot4}$	.54	.45
$r_{12\cdot5}$	.62	.55
$r_{12\cdot6}$	.62	.43
$r_{12\cdot34}$	.60	.45
$r_{12\cdot35}$	.68	.55
$r_{12\cdot36}$	.73	.43
$r_{12\cdot45}$	.54	.56
$r_{12\cdot46}$	.54	.44
$r_{12\cdot56}$	.62	.54
$r_{12\cdot345}$	.60	.56
$r_{12\cdot346}$	.68	.43
$r_{12\cdot356}$	.73	.53
$r_{12\cdot456}$	.54	.55
$r_{12\cdot3456}$	.68	.55

* Let 1 = flicker score.
Let 2 = psychiatric diagnosis.
Let 3 = hours of sleep.
Let 4 = time of day tested.
Let 5 = age.
Let 6 = "alcoholism."

diagnosis. A clearer picture of this situation may be afforded in the table (Table IV) of partial coefficients of correlation where whatever slight degree of relationship between these other variables and fusion frequency is shown to have slightly obscured rather than exaggerated the degree of correlation between fusion frequency and psychiatric diagnosis.

CONCLUSIONS

Flicker fusion frequency is a rather easily measured, almost physiologic function, and its relationship with other types of abnormal-metabolic-rate states is fairly well known. Should the results of this admittedly preliminary study be confirmed by further studies, the measure of flicker fusion frequency may provide a means of assisting in the better evalution of therapeutic results with patients exhibiting anxiety reaction.

Although overlap in the distributions of normal and anxiety reaction ("operational fatigue") cases prevents fusion frequency from being used for purposes of initial diagnosis or screening, the results obtained in this study suggest the possible usefulness of this index as an objective check on the progress of therapy. Because this study has demonstrated what appears to be a fairly close relationship between flicker score and psychiatric diagnosis of anxiety reaction, it may be expected that flicker fusion frequency would rise during the progress of successful treatment regardless of what an individual's flicker fusion frequency might have been when first referred.

The results of this preliminary study are sufficiently promising to indicate that a larger number of cases should be obtained. Experience in the preliminary study indicates that it might be well to take certain additional precautions in future studies. These are as follows:

1. Attempt to improve the flicker source. It was observed that the Strobotac light source, which is a neon tube, emitted certain slight irregular extraneous light fluctuations which confused some of those subjects who showed high thresholds for flicker fusion.

2. Standardize the rate at which the frequency of the source light oscillations are increased or decreased during fusion testing by substituting mechanical for human control of the frequency dial.

3. Attempt better to match the anxiety reaction cases and the control cases with respect to time of day tested.

SUMMARY

Flicker fusion frequency has previously been found to differentiate between normals and cases exhibiting various types of abnormal metabolic-rate states. This experiment attempted, in an exploratory way, to study the relationship between FFF and an anxiety reaction state found rather frequently among Army personnel shortly after their return from Air Forces combat assignments overseas.

Fifty such cases (termed "operational fatigue"

in the AAF) and 50 normal aircrew returnees were selected for testing under standardized conditions. Statistically significant differences were found between the mean FFF scores of the two groups although the distribution of scores overlapped considerably.

Because of the relationship between FFF and anxiety reaction ("operational fatigue") demonstrated in this study, it would be expected that the FFF scores of such patients would rise during the progress of successful therapy. Further research would seem to be indicated.

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CALIFORNIA DEPARTMENT OF MENTAL HYGIENE ANNOUNCES NEW PROGRAM AND POSITIONS

The State of California has embarked upon a new and progressive program for the prevention and treatment of mental disease and deficiency; preparation is already under way for the construction of several new mental institutions and for the modernization of existing facilities.

The Director of the Department of Mental Hygiene has appointed Dr. Lawrence Kolb, former Chief of the Mental Hygiene Division of the United States Public Health Service, to the position of Deputy Director, Medical, to develop and administer a program of raising treatment standards to the highest possible level and generally to promote mental health in the community.

A new position of Director of Clinical Services has also been established at each one of the mental institutions in the State of California. These positions carry responsibility for the supervision of medical activities in the institution and the development of a teaching and research program. The Clinical Directors holding these positions will be relieved of administrative responsibilities as far as possible so that they may devote their full attention to the medical aspects of their work.

The Langley Porter Clinic, in San Francisco, under Dr. Karl M. Bowman, which operates in conjunction with the University of California, is also included in the Department of Mental Hygiene. This institution offers an intensive twelve-week refresher course in psychiatry, and physicians employed by the Department are eligible for assignment to the Clinic to participate in this course.

At present there are available in the Department positions for physicians and surgeons, psychiatrists and clinical directors. Salaries range from $345 to $715 per month, depending upon experience and training. Veterans applying will receive special consideration for appointment and extra credit in civil service examinations. Physicians who are licensed in any other state may practice in a California mental institution for one year before securing their California license.

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URETHRAL DISCHARGE AS A SYMPTOM OF PSYCHIATRIC DISORDER

W. D. ROSS, M.D.*

A common problem presented for psychiatric consultation among Canadian and British troops in Europe during the year following VE-day was that of the soldier complaining of a persistent or recurring urethral discharge which was found, on examination, to reveal no organisms and no, or few, pus cells. These individuals were consistently found to present certain emotional disorders and in most cases, where it was possible to carry it out, they were helped by psychiatric treatment. Conversation with various medical officers, both overseas and in Canada, has indicated that the condition is actually quite widespread. At least one standard text book of urology mentions "urethrorrhea," "prostatorrhea," or "spermatorrhea" as entities distinct from urethritis, but without much description of psychologic aspects, and there is little to be found in the literature in English on these entities from a psychosomatic standpoint. It therefore appears worthwhile to report the psychiatric findings in the cases among the troops in Europe.

The following is a representative case history:

Sgt. C.: This 24-year-old unmarried male presented himself for medical check-up because of a few drops of urethral moisture each morning which he was afraid signified venereal disease. He was admitted to hospital for investigation where urethral and prostatic smears were obtained, as well as psychiatric examination. He had been a leading Canadian athlete prior to enlistment. He had been popular, with a large number of friends, but he had always suffered feelings of insecurity and inadequacy and he found athletic success a means of bolstering his confidence. He had been brought up according to a strict moral code and, previous to enlistment, he had adhered to his belief that he should not engage in sexual intercourse outside of marriage. On infantry service in Italy he developed severe anxiety symptoms and was downgraded and re-allocated to administrative duty. After transfer to the Northwest European theatre he participated on three occasions in casual intercourse with "pick-ups," each time being followed by feelings of guilt and depression. The presenting complaint developed after he fell in love with a French girl whom he wished to marry. At this time he had been continent for several months but was fearful that his past activities had resulted in the contraction of venereal disease. Urethral and prostatic smears were negative for organisms or pus cells and blood Kahn was negative. He obtained considerable insight with psychotherapy and was returned to duty.

Records have been kept of 30 such patients, with variations, in which urethral discharge was the main complaint, and of 8 patients presenting various nervous symptoms and bodily pains accompanied by urethral discharge but not as the main complaint. The urologic investigations of these patients were unfortunately, but of necessity, very incomplete and very unequal from case to case. This was due to the fact that the cases were seen in various hospitals and casualty clearing stations in England, Holland, and Germany, with varying facilities for urologic and bacteriologic examination and varying opportunity for urologic consultation. The facilities varied even in the general hospital where most of them were seen, where there were constantly changing personnel in charge of the urethritis ward to which many of these patients had been admitted. In some cases the urethral and prostatic smears were taken and examined by the author in the absence of more specialized assistance.[1] No claim is being made, therefore, that infection has been completely ruled out in every case. The emphasis is rather on the positive psychiatric features encountered in these patients, who were a problem from a general medical viewpoint, and who had failed to clear up with penicillin or sulfa therapy when these had already been tried. Cases in which psychiatric factors did not seem significant have not been included in the series, and in most of such cases more intensive urologic study revealed a prostatis or posterior urethritis. The psychiatric investigations were all carried out by the author by means of interview of at least one hour in every case, with follow-up psychotherapeutic sessions in most cases.

UROLOGIC ASPECTS

All patients had examinations of urethral smears at least once, 2 of them as often as thirteen or fourteen times, with three to four times being the average for the 38 patients. These were reported as showing 0 to ++ pus cells excepting 3 cases with +++. No organisms were found except in 2 cases where some extracellular gram-negative diplococci of doubtful significance were reported. Wet smears were negative for trichomonas. Seven patients had had acute gonorrhea and 3 a purulent

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[1] Such detail as there is available to present from the urologic aspects is due largely to the assistance of Lt. B. Baittle, R.C.A.M.C., formerly bacteriologist at No. 7 Canadian General Hospital, who reviewed the laboratory records of many of these patients.

discharge considered to be nonspecific urethritis, but at the time of psychiatric study these particular patients were free from more than the occasional pus cell in the urethral smear and were presented as problems of continued complaint in spite of apparently adequate chemotherapy. Prostatic massages were done in 16 patients and urethral or prostatic cultures in 4.

Prostatic smears never revealed more than an occasional pus cell nor any organisms except some diphtheroids of doubtful significance which were present in one case. The few cultures were all negative. A few patients were studied by urethroscopy, with no evidence found of inflammation, although the surgeons did not express any opinion concerning congestion, which has been reported as an accompaniment of certain sexual activities (9).

TABLE I

PATIENTS WITH URETHRAL DISCHARGE AS THE MAIN COMPLAINT

Psychoneurosis—depression	13
Psychoneurosis—anxiety	9
Psychoneurosis—hysteria	4
Prepsychotic personality—schizoid	2
Psychopathic personality—with abnormal emotionality	1
Psychopathic personality—with abnormal sexuality	1
Total	30

TABLE II

PATIENTS WITH URETHRAL DISCHARGE AS AN ASSOCIATED COMPLAINT

Psychoneurosis—hysteria	3
Prepsychotic personality—schizoid	2
Psychoneurosis—depression	2
Psychoneurosis—anxiety	1
Total	8

PSYCHIATRIC ASPECTS

A general summary of the 38 cases is presented in Tables I and II in the form of the diagnoses according to the nomenclature of the Canadian Army Overseas. It is to be noted that psychoneurotic mood reactions predominated among the patients with urethral discharge as the main complaint, while dissociative and symbolic disorders assumed a relatively more important place among the patients in which other symptoms were stressed. All patients presented either a mood change or some substitute for it, and since the substitute reactions were more common along with associated symptoms it appears that a mood disorder was the characteristic psychiatric accompaniment of urethral discharge in these patients altogether.

Reaction Type

On assessment of the reaction at the time of examination, 16 patients were found to be predominantly depressed and 11 patients predominantly anxious, although most of these showed mixtures of depression and anxiety. One depressed individual had also had an hysterical fit. Another one also presented rebellious anti-authoritarian behavior. In the other 11 patients some anxiety could be found, but it was not in proportion to the other complaints or to the patient's reality situation. These patients presented bodily pains or convictions of disease which verged on somatic delusions, and it was considered that the mood was actually somewhat flattened in keeping with an hysterical conversion or a prepsychotic changed in the direction of schizophrenia. Depending on the previous personality of the patient, the integrity of the thought processes, the adequacy of rapport, and the response to treatment, these patients were diagnosed as hysterics or prepsychotic schizoids. In some of them the conviction of disease, a urethritis-phobia resembling syphilophobia, had some characteristics of an obsession, but none of the patients had full-blown obsessive-compulsive neuroses. Taking into consideration the actual urethral discharge which they presented, as well as characteristics consistent with other diagnoses, the diagnosis of psychoneurosis—obsessive-compulsive state was not used. Many of them could have been considered as obsessional personalities, but the reaction at the time of examination was assessed apart from this.

Previous Personality

In assessment of the previous personality the temptation was resisted to pigeon-hole each patient with some loose term such as "schizoid," "obsessional," "psychopathic," etc. A record was kept in purely descriptive terms of the kind of behavior which stood out in his past life according to the personal history obtained from him. The outstanding characteristics have been summarized in Table III, where the number of cases are indicated in which each characteristic was found to be the chief feature by itself or combined with one or more of the other characteristics on the list.

It will be observed that excessive conscientiousness, either by itself or with other features, was present in one-half of all patients. Other frequent cha

acteristics included excessive shyness and a tendency to drift on the line of least resistance, for example, to follow the behavior of his associates even when it conflicted with his own standards. In 3 individuals there was considerable discrepancy between the latter tendency and a simultaneous excessive conscientiousness, so that these individuals appeared to be undergoing a progressive disintegration of their personalities.

Habitual hypochondriasis and excessive dependency were also notable, especially along with other features.

One individual gave a history of delinquency and emotional instability, but he admitted more guilt feelings than the usual aggressive psychopath. Another individual was an aggressive athlete without a notable degree of the common characteristics listed. One individual who was excessively conscientious complained of homosexual inclinations around which his anxiety was centered. Three individuals presented no special characteristics in their past behavior and, for these, recent circumstances loomed largely in the development of a mild mood disorder rather than long-standing conflicts or a more serious psychiatric condition.

TABLE III

PREVIOUS PERSONALITY CHARACTERISTICS

	As chief feature	With other features	Total
Excessive conscientiousness	12	7	19
Excessive shyness	2	7	9
Drifting	2	6	8
Hypochondriasis	2	3	5
Excessive dependency	2	3	5
Delinquency	1	..	1
Aggressive athleticism	1	..	1
Homosexuality	..	1	1
No special characteristics	3	..	3

Sex History

The past sex history was noted particularly. Eleven individuals were married, 6 were engaged and the rest single. Ten of the married individuals had had extramarital intercourse on one occasion since marriage and most of them had not had extramarital intercourse before marriage. The other married one had had intercourse on two occasions since marriage and occasionally before marriage. Two of the married individuals had remained continent even for many months after they learned of the infidelity of the wife. One of the engaged individuals had had intercourse once in his life. The other 5 had had intercourse occasionally, usually at intervals of many months. All of these individuals had intended to be faithful to wife or fiancée but had fallen from these intentions after varying periods of separation on overseas' service.

Of the single individuals one had never had sexual intercourse. He was worried about masturbation and the urethral discharge came on when he was sexually excited from "petting" with a girl to whom he was contemplating becoming engaged. When he presented the complaint of urethral discharge to his medical officer he gave a false history of intercourse for fear that his masturbation would be discovered. He was diagnosed as nonspecific urethritis on this false history of exposure, but he later confessed the true state of affairs while under psychiatric treatment.

One other single individual who complained that he suffered from homosexual temptations had developed his urethral discharge after an occasion on which he was so drunk that he did not remember whether he had intercourse or not, or whether, if he did, the relations were homosexual or heterosexual. He expressed the belief that many other individuals under treatment for nonspecific urethritis were homosexuals but he was the only individual in this series who admitted homosexual inclinations.

Two single individuals had had intercourse fairly frequently, varying from several times a month to once in a few months but having repeated the act several times altogether. One single individual had had fairly frequent intercourse around the age of 12-13, but on being exposed to different moral standards had stopped for several years and then had indulged only about once every six months around the ages 23 to 25. One other had had intercourse only occasionally until he developed a depression in relation to a urethral discharge and then had intercourse repeatedly over the six months' period previous to psychiatric examination. The other 15 unmarried individuals had had intercourse only occasionally, usually at intervals of several months and never more than a half-dozen times in their life. The age of first intercourse varied from 12 to 32 and averaged 22, which seems higher than is usually admitted by the average soldier but no control figures have been obtained.

With few exceptions, then, the sexual activity of these individuals has been characterized by continence with an occasional lapse. Their attitudes towards sexual intercourse were also of interest. The married or engaged ones were usually continent because of a desire to be faithful to their partners, but some of them also had rather exaggerated guilt attitudes to any form of sexual expres-

sion. The 2 married ones whose wives had been unfaithful had remained monogamous in their attitude for some time in spite of the infidelity. Most of the unmarried individuals had always had strong convictions that sexual activity was sinful and might result in severe retribution in some form. One of them had developed such convictions only after a move to a new neighborhood at the age of 13, after living in an area where promiscuity was a common practice. Four individuals had frightening beliefs about horrible consequences which would follow on the practice of masturbation. One individual always felt disgusted by sexual matters. The one homosexual individual and one of the 2 more promiscuous individuals admitted very strong mother attachments. Five individuals did not have particularly strong convictions of sin about sex, but they had vivid conceptions of the effects of venereal disease so that they condoned intercourse with a "good" girl but were frightened of the ones in Europe.

Every one of the 38 individuals admitted guilt feelings about his sexual activity, although some did not make this admission until a second or third interview or until disinhabited with intravenous sodium amytal. Some of them had not recognized guilt feelings until they developed a urethral discharge. Some had felt increased guilt with each successive indulgence in intercourse, while most had felt about the same amount of guilt after each intercourse. A few had felt progressively less conscious guilt with each intercourse but a recrudescence of guilt feelings in association with urethral discharge. At the same time as admitting guilt feelings all except the one individual who claimed sex to be disgusting admitted having had a desire to have intercourse again. All excepting 3 individuals were fairly successful at resisting this desire.

Relationship of the Symptom

The time of onset of urethral discharge was noted both in relation to date of last exposure and in relation to onset of, or definite change in, the psychiatric state which was diagnosed. The 10 individuals who had been considered to have a specific or nonspecific urethritis at the onset had first developed a purulent discharge about four to ten days after the date of last exposure. The discharge had become clear and mucoid under chemotherapy but persisted until psychiatric treatment. Nine individuals developed the discharge about a week to ten days after exposure. Eight developed it three to four weeks after, one six weeks after, and in 8 it was not until several months after, usually in relation to increased temptation to engage in intercourse again. The one individual, already mentioned, with marked masturbation conflict, had had no exposure, and one other individual developed the discharge just a day after almost having intercourse while drunk, but having stopped ante portem.

Seven of those with a definite urethritis seemed to have developed their psychiatric state, or to have undergone a recent change in a long-standing psychiatric state, following upon the development of the urethritis. The other 3 with a definite urethritis had exposed themselves while in a state of depression which became increased, with superadded anxiety, following infection. Seventeen of the others appeared to have developed the discharge along with the onset of the psychiatric condition which was diagnosed, and 9 along with a recent change in a long-standing psychiatric state. Two developed the discharge late in the course of a long-standing psychiatric state, without relationship to a definite change. In almost all cases, therefore, the relationship of the urethral discharge to psychiatric status and personal situation was appropriate for a psychosomatic disorder or the psychosomatic maintenance of an originally infective disorder. When these relationships were not found, the cases were referred for more intensive urological study.

An increase in the discharge had often occurred in relation to indulgence in alcohol. Such is apparently the case in infective urethral discharge also. In the soldiers in this study it was often noted that drinking was accompanied by an increase in sexual conflict due to increased temptation and that this may have been a factor in the increase of discharge.

Treatment

Twenty-eight of these patients were given psychiatric treatment by the author. The other 10 could not be treated, 5 because practical considerations demanded evacuation as unsuitable for treatment with the facilities available, and 5 because more than one interview was not possible owing to troop movements. Treatment was mainly by psychotherapy. A modified insulin routine was also used in three cases. Intravenous sodium amytal interviews were used in 7 cases. A written autobiography was obtained from the patient in 4 cases as a therapeutic measure. All the others were given opportunity for emotional catharsis in straightforward sitting-up interviews. The usual technic was to encourage the confession of guilt feelings in a "father confessor" manner so that the individuals developed increasing insight into their guilt feelings along with an increasing sense of being forgiven. They

also obtained increasing insight into the temptation to repeat the behavior which was unacceptable to them, and most of them solved the conflict by a stronger determination to adhere to their original intentions although with a more enlightened attitude to sex and venereal disease. At the same time they received assurance that they did not show evidence of venereal disease and that their symptom was explainable as a result of the emotional situation. The more serious psychiatric problems were among those evacuated but the less serious cases usually did very well with such treatment.

Of the 28 who were treated, 2 were not seen after the last treatment session, but the results several days after the last treatment in the others were as follows: 23 ceased complaining of the urethral discharge, 13 being dry and 10 accepting it as a physiologic condition; 3 persisted in the complaint. Fifteen were happy and symptom-free with regard to psychiatric complaints, 10 were improved in regard to the psychiatric condition, and one was unchanged in this regard. Unfortunately only 3 individuals were seen as long as several months after treatment. One who had been unchanged by treatment had remained unchanged. One had remained symptom-free. One officer had developed some other minor neurotic symptoms but no urethral discharge and remained appreciative of treatment to the extent that he sought psychiatric referral for one of the men in his company against the opposition of his medical officer.

One aspect during treatment which requires special mention is the development of suicidal ideas in 2 individuals when insight was obtained too rapidly. These patients were successfully tided over this phase and the experience was used to impose caution in the speed of psychotherapy with other patients, especially in 2 others whose depression increased appreciably at times during psychotherapy. There is definite knowledge of at least one individual, not examined by the author and therefore not included in this series, who committed suicide after reporting to a medical officer with a nonpurulent urethral discharge which probably belonged in this group.

Because of the frequency of this disorder and the success of treatment at a superficial level of psychotherapy in those without severe psychiatric disorders, a conference of medical officers was held in the Canadian Army Occupational Force and instructions were given concerning the handling of these cases. Following these instructions some of the medical officers achieved success at handling mild cases themselves and they were more alert in obtaining psychiatric referral for the individuals with considerable psychiatric difficulty.

DISCUSSION

The foregoing study was uninfluenced by the literature since adequate library facilities were not available when most of the cases were seen. It was clear to the author and his medical confrères at the time that little mention had been made of such a condition in the course of regular medical education. It was recalled that standard text books on psychosomatic medicine (2, 11) described several reports, especially in German, about psychogenic factors in leukorrhea in females, but that there had not been much emphasis on this apparent male counterpart. Subsequent search of the literature has indicated that cases of this disorder have been described but have been variously considered as persisting urethritis (6), "urethritis simple" (1), spontaneous nonspecific urethritis (8), spermatorrhea (4), urethrorrhea or prostatorrhea (3, 5, 10).

One recent text book of urology makes no mention of urethral discharge apart from urethritis and prostatitis (7), and even attributes various nervous symptoms to a primary prostatovesiculitis or cowperitis without considering the reverse possibility, that the "morning drop" might be the result rather than the cause of emotional disturbance. Another standard reference, however, (12), placed the local pathology in more perspective as far back as 1927: "We no longer believe that slight, scarcely demonstrable lesions, merely because they are in the genital organs, have any semi-mysterious powers of bringing about the severest mental and physical disorders." Sexual excitement without gratification and other variations in sexual behavior, as well as the pharmacologic effects of alcohol, have been cited as noninfective causes of congestion of the verumontanum and posterior urethra, as well as of a mucoid discharge (5,9,10,12). Pelouze (10) mentions the importance of the psyche but in terms of the condition precipitating a neurosis rather than vice-versa. Altogether there is a lack of literature in English describing the particular psychologic situations associated with and antedating these physiologic disorders.

We can form no opinion from this study as to whether the discharge is to be attributed to Cowper's or other urethral glands or to the prostate. Chemical analysis of the fluid might elucidate this question but since all these glands are well innervated on pathways of importance in sexual behavior there is no difficulty in conceiving of psychosomatic mechanisms for the production of the symp-

tom. Indeed the suprising fact is that venereal disease specialists had so often assumed an infective origin in many of these cases rather than entertaining the possibility of a physiologic disorder. When we began to consider the condition from the viewpoint of the total organism it was aptly dubbed by one of the medical specialists as a "mucous colitis" of the penis. In the education of the medical officers in the force about this condition another medical specialist coined the useful slogan, "consider the person and not just the penis."

The most consistent psychologic findings in these soldiers in association with this symptom included the attitude of guilt about their sexual behavior and an effort to refrain from promiscuity in spite of the temptations in this direction. It would seem most likely that the discrepancy between sexual stimulation and opportunity for expression could have been responsible for the persisting hypersecretion of the sex glands. The condition could be considered analagous to a chronic salivation in a starved individual with food just out of reach. In fact, the concept of "mouth-watering" was used with effect in the explanation given to these patients in psychiatric treatment.

In the actual treatment of these individuals care was taken not to suggest that increased sexual activity would relieve the discrepancy since it was realized that in most of them their personal standards were such that uninhibited activity would result in more severe personality disturbance. In fact, one individual was seen who developed an increased depression after following the hastily given advice of a medical officer to "go out and have fun." Consequently, the ease with which one can explain this symptom should not be allowed to obscure the fact that this disorder is comparable to the conditions which have been described as "organ neuroses" and that its treatment requires the careful consideration of the total personality problem. According to Hitschmann (4), who pointed out that this condition is not limited to "neurasthenics," in whom it had been described by Reich and Schilder, the attitude of patients in whom this condition becomes chronic is one of narcissism. Our study was not psychoanalytic in method and this statement is neither denied nor confirmed, although the most intractable cases were certainly severely disordered individuals on the borderline of psychosis. For similar reasons we have nothing to contribute on the question of urethral erotism in these patients.

It appears that urologists and general practitioners who encounter these cases, including ones where infective and psychosomatic factors interact, should be more on the alert for the important personality problems which are involved, at the same time as taking care to rule out a persisting prostatic infection. There remains to be done an investigation in which such patients as these are subjected simultaneously to careful detailed urologic and psychiatric study, including more intensive analysis of individual patients than has been possible under the conditions of this study.

SUMMARY

Attention is drawn to the symptom of urethral discharge accompanied by psychiatric disorder. Thirty patients have been studied with this discharge as the chief complaint and 8 patients presenting various nervous complaints in addition. These patients usually showed few or no pus cells in urethral or prostatic smears. Patients have been reported only in whom a definite psychiatric diagnosis was possible, as follows in order of frequency: reactive depression, anxiety state, hysteria, prepsychotic personality, and psychopathic personality. Previous personality characteristics were frequently as follows: excessive conscientiousness, excessive shyness, tendency to drift on the line of least resistance, hypochondriasis, and excessive dependency. Usually the sexual activity was that of continence with an occasional lapse always followed by guilt feelings. The discharge often developed after a period of continence with temptation, excepting in a proportion of cases in which it represented the persistence of an originally infective discharge. Its onset or persistence could usually be correlated with the psychiatric history. Twenty-eight patients were given psychiatric treatment, mostly psychotherapy at a fairly superficial level. Short term follow-up indicated improvement in the local condition as well as the psychiatric disorder, although failures occurred and risks were involved. Probable mechanisms have been discussed in relation to the relevant literature.

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ABSTRACTS OF PERIODICAL LITERATURE

THE AMERICAN REVIEW OF TUBERCULOSIS. VOL. LIV, JULY 1946, NO. 1

H. S. WILLIS: *Employment of ex-tuberculous patients.* pp. 9–12.

The number of man-days of work lost by ex-tuberculous patients at Maybury Sanatorium did not significantly differ from the number of man-days lost by other employees at the same institution. This supports the contention of the United States Civil Service Commission that handicapped employees "have fewer accidents [and] are conscientious, superior workers [who] expect no favors and produce as well as or better than the average of normal people." (BRUCE R. MERRILL.)

JOSEPH NEWMAN. *Patients' information about tuberculosis.* pp. 13–24.

A careful statistical study of the knowledge of old and new patients about tuberculosis as compared with the knowledge of a group of experts and a group of college students. The conclusions are ambiguously stated, but the authors feel that they have developed a useful test for further use. (BRUCE R. MERRILL.)

SEPT. 1946, NO. 3

LOUIS L. FRIEDMAN AND JAMES R. GARBER: *Pregnancy and tuberculosis.* pp. 275–282.

In this review of the literature the authors reach the conclusion that "Pregnancy exerts little or no influence on the incidence or course of pulmonary tuberculosis." They recognize that the "benefits to be derived from a happy and financially sound marriage far outweigh the risks involved, if the patient is cooperative and properly instructed in the technique of contraception," and that "Of the numerous variables which influence the ultimate prognosis in these patients, the phthisiologist's ability as a sociologist should be second only to his medical prowess if successful therapeutic results are to be achieved." They do not discuss the articles that have been written dealing with the psychosomatic aspects of this problem. (BRUCE R. MERRILL.)

OCT.–NOV. NOS. 4–5

J. D. RILEY: *The psychological moment in the treatment of tuberculosis.* pp. 340–343.

Dr. Riley has recognized the very important trauma that a diagnosis of tuberculosis can be for the patient. He points out that the entire future course of a patient's life may depend on the sagaciousness of the physician who handles the emotional problems inevitably aroused by this diagnosis. He says: "It is then that the doctor functions primarily as a teacher, a friend, and only secondarily as a man of science." He stresses the importance of not trying to coerce the patient, of being willing to wait for the patient to develop an *emotional* (abstractor's italics) acceptance of the problem, and a positive desire to be treated. He indicates that this is a problem of many individual variations and that the doctor must exercise an intuitive sort of judgment in each case because he "must stress the necessity for a drastic change in the life of the patient, yet never proceed faster than the patient is willing to go along with him in his thinking."

He does not acknowledge his sources or give any references. (BRUCE R. MERRILL.)

DEC. NO. 6

LEO PRICE: *Tuberculosis—a labor problem.* pp. 512–526.

A review of the program initiated in 1913 by the International Ladies Garment Workers Union in an attempt to demonstrate the importance of this problem to union members. Unions often misunderstand and mistakenly oppose case-finding programs. (BRUCE R. MERRILL.)

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PAUL R. HAWLEY: *The tuberculosis program of the Veterans Administration.* pp. 1–7.

An interesting change in Veterans Administration policy is indicated. Much more attention will be focused on rehabilitation in the future, with special institutions for convalescent patients, etc. They are also going to try to improve the secondary gain problem by extending disability allowances until the patient has been successfully at work for two years. There are hints of cooperation with "other agencies," and "all branches of the *physical* (abstractor's italics) medicine service," but rehabilitation is still spoken of as a "hardening process" and there is no evidence of any recognition that rehabilitation is, essentially, a psychologic process. (BRUCE R. MERRILL.)

HERBERT R. EDWARDS: *The national tuberculosis association and its interest in the tuberculous veteran.* pp. 8–16.

Another survey of over-all policy with less emphasis on rehabilitation and even less understanding of its fundamentally psychological nature. There is considerable discussion of special training of rehabilitation personnel, but the numerous committees appointed for the investigation of this problem do not include one to study the psychosomatic aspects of the problem. They state that they have decided to utilize "existing social service agencies." (BRUCE R. MERRILL.)

HERMAN E. HILLEBOE: *Recent developments in tuberculosis control.* pp. 17–20.

The tremendously important field of psychological readjustment in recovery from this disease is disposed

of with the remark: "It is equally certain that a tuberculous person whose disease has been arrested must be helped in returning to normal life." (BRUCE R. MERRILL.)

ERNEST S. MARIETTE. *The significance of rehabilitation.* pp. 38–42.

An entire article on rehabilitation without the faintest indication that the author recognizes that psychodynamic factors are involved. The problem is discussed from the point of view of the significance of positive sputum, severity of lesion, etc., without any mention of the fact that different personalities may require different handling. The program in his institution, he says, is based on the patient's educational background and work record. (BRUCE R. MERRILL.)

I. D. BOBROWITZ: *Rehabilitation of the tuberculous.* pp. 43–48.

An interesting presentation of the intelligent and comprehensive program now underway at Otisville Sanatorium. He recognizes the importance of allaying anxieties by having a social service contact prior to admission to the sanatorium. The importance of having "personal, social and family information" about the patient at the time of admission is also recognized, as is the nature of the initial interpersonal relationship established at the time of admission. He even includes a discussion of the importance of an educational program for the hospital employees so that they will understand and properly cooperate with the program. He significantly states: "Assignments to rehabilitation are not merely determined by the stage of the disease or type of therapy." The rehabilitation team, however, does not include a psychiatrist or psychologist. The importance of the rehabilitation program in providing morale and diversion are discussed, and it is not looked upon as a simple, mechanical "hardening process." The importance of intensive postsanatorium follow-up is stressed, but the regressive psychological forces that come into play at this time are not recognized. (BRUCE R. MERRILL.)

A. N. AITKEN: *Occupational therapy and rehabilitation.* pp. 49–53.

Mr. Aitken traces the very interesting development of the rehabilitation program at Niagara Sanatorium, Lockport, New York, which began when a group of patients formed a self-governing body "to help people with tuberculosis to return to a life of healthy, happy usefulness." He indicates that he has a very clear understanding of the importance of psychodynamic factors in this disease and he describes the practical program for handling them that has been developed at his institution. He says: ". . . patients are subjected to a multitude of emotional disturbances . . . these . . . begin with the diagnosis of the disease . . ." etc., and he quotes Trudeau's formulation of the principles of sanatorium treatment, *i. e.,* "rest for the disease and education for the patient." Mr. Aitken's article would make good reading for any occupational therapist. (BRUCE R. MERRILL.)

DYNES, JOHN B.: *Objective method for distinguishing sleep from the hypnotic trance.* Arch. Neurol. & Psychiat., **57**:84, 1947.

EEG tracings taken during the induction of the hypnotic trance and during the trance are no different from those taken during the normal waking state, and show no resemblance to tracings taken during sleep. This confirms the opinion of investigators who have claimed that hypnosis is not a sleep variant. (LOUIS PAUL.)

ROCKWELL, FRED V., AND SIMONS, DONALD J.: *The electroencephalogram and personality organization in the obsessive-compulsive reactions.* Arch. Neurol & Psychiat., **57**:71, 1947.

Abnormal EEGs characterized by excessive amounts of 3/7-sec. waves were found in 13 out of 24 patients with obsessive-compulsive symptoms. These 13 had "clearcut disturbances of personality organizations," *i.e.,* psychopathic personalities. (LOUIS PAUL.)

FRANK, JEROME D.: *Atropine treatment of hypoglycemic fatigue states.* Psychiatric Quart., **20**:674, 1946.

In 22 of 80 wartime psychiatric casualties in the Philippines, who included weakness in their complaints, intravenous glucose tolerance tests showed a half-hour blood sugar below 100 mg. per cent.

Thirteen of 17 treated with atropine and a sugar-free diet showed definite rises in the half-hour blood sugar, and of these 6 reported symptomatic improvement, this occurring within forty-eight hours.

Improvement, it was felt, depended less on the rise in the glucose curve than on the patient's attitudes toward treatment. However, "atropine may play a helpful subsidiary role by favorably modifying glucose metabolism and thereby setting the stage for clinical improvement." (LOUIS PAUL.)

MENNINGER, W. C.: *The future role of psychiatry in the army.* Mil. Surgeon, **100**:2, 1947.

In a most timely article, the author records the experiences of psychiatry in the Army during this last war. The article will strike familiar chords in the hearts of all Army psychiatrists.

Menninger points out that much precious war experience was forgotten or ignored. When this war began, the role of psychiatry in the medical department was enshrouded in prejudice and misconception. The role of psychiatry was considered only in terms of temporary custody and disposition of psychosis. Mental hygiene units in basic training camps did not start to function until the middle of 1943. Psychiatrists were not placed in combat divisions until late in 1943.

Menninger sets forth recommendations for the utili-

zation of psychiatry in the peacetime Army, as well as necessary steps to prepare for any future emergency. The article, an abstract of a vast problem, defies further abstraction and should be read by every psychiatrist who has any interest in the problem. (MORRIS W. BRODY.)

BAILEY, P.: *Neuropsychiatric casualties and the program of the Veterans Administration.* Mil. Surgeon, **100**:2, 1947.

The program of the neuropsychiatric service in the Veterans Administration is dedicated to the care and rehabilitation of veteran patients and to the discovery of better methods for the management of present and future neuropsychiatric problems. Three principal goals are:

1. To provide the veteran with the best possible neuropsychiatric care.
2. To train enough psychiatrists and neurologists to perform this task.
3. To set up a sound research program which will better illuminate unsolved neuropsychiatric problems and which will eventually equip both civilian and government neuropsychiatrists with a greater knowledge and experience to meet future emergencies.

The program calls for active cooperation with all civilian and governmental medical departments, which should participate in this national effort to develop the health of our people to its highest potential. (MORRIS W. BRODY.)

RAINES, G. N.: *Current problems in naval psychiatry.* Mil. Surgeon, **100**:2, 1947.

The author states that it is now appropriate to review the problem which faces Naval psychiatry. He poses the question: How successful was Naval psychiatric screening? Should the screen be of a finer or coarser mesh? How much of the psychiatric casualty rate could have been prevented by more adequate personnel management? How effective was our prison psychiatry? How valid was the use of such diagnostic terms as operational fatigue and combat fatigue? Could preventive steps have been taken in the cases diagnosed combat fatigue, and if so, what were they? The author raises a multitude of thought-provoking questions that some day must be answered.

Raines also discusses the question of prejudice from our nonpsychiatric colleagues, the need to train medical personnel in psychiatry and how this is to be accomplished. Lastly, the plans for Naval psychiatry can be realized only if money for these plans is made available by appropriation. (MORRIS W. BRODY.)

BONGIOVANNI, A. M.: *Psychometric examinations aboard a destroyer.* Naval Med. Bull. vol. 47, no. 1.

The author administered the Kent Oral Emergency Test to naval personnel aboard a destroyer during the period 1944-1945. Four per cent mental defectives were found, none being marked in degree. Mentally deficient enlisted men seem to have a place in the Navy; they are to be limited to restricted detail. Greater advancement was apparent among those of relatively higher I.Q.

Psychometric measurements for enlisted men may be of value in properly placing these men, assigning them duties in accordance with their scores. This should lead to greater efficiency and in times when rapid learning is so essential with regard to the operation of new and complicated equipment, such measurements would prove to be of practical value. (MORRIS W. BRODY.)

LUDWIG, A. O. AND RANSON, S. W.: *A statistical follow up of effectiveness of treatment of combat induced psychiatric casualties.* Mil. Surgeon, **100**: 2, 1947.

The authors conclude that of a group of 358 combat-induced psychiatric casualties evacuated to the rear from Seventh Army Psychiatric Centers, whose status was reviewed six to eight months later, 310 had reached a new duty assignment and were either present for duty or has been disposed of in a known manner. Of these 310 patients, 288, or 93 per cent, had performed satisfactorily or better according to replies of commanding officers to the follow-up letters.

Such patients performed adequately even though residual symptoms were present in 29 per cent of reassigned individuals. Eighty-three and four-tenths per cent of the patients with residual symptoms had performed satisfactorily or better.

Data are presented in regard to the age, rank, total length of combat exposure prior to admission, precipitating factors, wounds, length of time spent in hospitals and replacement depots, type of new assignment, and length of time spent on new assignment at the time of the follow-up study.

It appears that fairly brief hospitalization and brief psychotherapy, undertaken early in the course of the illness, and in the forward area, result in an adequate posthospitalization work performance in a highly satisfactory percentage of combat-induced casualties. (MORRIS W. BRODY.)

STEIN, M.: *Neurosis and group motivation.* Bull. U. S. Army M. Dept., 7:3, 1947.

Morale is the individual's feeling toward his group, his degree of identification with it, and the group's feeling about itself. Its primary effect is to determine the military efficiency of that group—whether it is a squad or an army. Morale can be actively influenced by deliberate measures. It is not fixed. It can be built up, and it can be destroyed.

Good morale protects the soldier from anxiety—first, by offering him the protection derived from group identification, and second, by directing hostility into proper channels (toward the enemy and not toward the forces that support him). (MORRIS W. BRODY.)

BOOK REVIEWS

ALLEN, RAYMOND B.: *Medical Education and the Changing Order.* New York, The Commonwealth Fund, 1946, 153 pp. $1.50.

The New York Academy of Medicine in 1942 established a Committee on Medicine and the Changing Order which sponsored a series of conferences of unusual interest on various aspects of medicine. Subsequently the cooperation of a number of the authorities who took part in the conferences was enlisted in the preparation of a series of monographs covering some of the important topics. This particular one of the series amply confirms the wisdom of the Committee in assigning the subject of medical education to Dr. Allen who was at that time Executive Dean of the Colleges of Dentistry, Medicine and Pharmacy at the University of Illinois and who since then has become Chancellor of the University of Oregon.

Although the monograph is too short to permit great detail, Dr. Allen has succeeded admirably in covering the field of medical education in a comprehensive manner. Starting with a consideration of the challenge facing medical education today, the author looks to the past in a chapter on the historical background and then devotes the major portion of the book to an analysis of different aspects of current medical education. He sees very clearly that the study of medicine must embrace the study of life in all its aspects—physical, psychological and social, and that, to be wise, the physician must understand the setting in which people who may become his patients live. He pays tribute to Adolf Meyer and the others whose teachings were instrumental in broadening the physicians interest in disease to include attention to the patient as a person. Psychosomatic medicine is touched on only briefly, as must be the case in a work of this type, but there is a thorough appreciation of the important relation between psyche and soma, and emphasis is given to the need of placing adequate stress on this concept in modern medical training. Dr. Allen has written an enjoyable and informative essay which will be of interest to everyone concerned with medical education.

CURRIER MCEWEN.

Conference on Diagnosis in Sterility, 1945. Edited by Earl T. Engle. Springfield, Illinois, C. C. Thomas, 1946, 237 pp. $5.00.

This excellent volume is a product of the January, 1945, conference sponsored by the National Committee of Maternal Health. The Proceedings were published in book form, thus making available an excellent volume dealing particularly with the more troublesome aspects of marital sterility concerning the practitioner. The series of conferences dealing with problems of human reproduction which have been sponsored by the National Committee of Maternal Health have come to occupy a pre-eminent role in the furtherance and organization of knowledge regarding the fertility of men and women. The scope of these presentations has been wide, ranging from the basic sciences to aspects of medical practice in relation to barren and sexual adjustment. The meetings have attracted many eminent investigators and clinicians, thereby affording an informal exchange of opinions, often about controversal material not suitable for publication or presentation to the formal societies.

The contents of the book are about equally divided in subject matter between the male and female, yet the interlocking problems are adequately dealt with in the published discussions, thereby preserving their indiscerptibility.

The papers presented on the first morning concerned semen examinations, and clinical interpretations of the information derived therefrom. Testicular biopsy, the role and physiology of the accessory sexual glands of the male, and the influence of estrogens upon the seminal vesicles completed the topics of the first session.

The afternoon program was devoted to endometrial biopsy, interpretation of body temperature curves, and postcoital examination of cervical mucus.

The second day of the conference was given to history-taking of infertile couples, interpretation of tubal patency tests, and a report on the effect of androgens and gonadotropins upon the testes. A reconsideration of "Pelvic Congestion" as a cause of infertility was presented, followed by a summation of the papers of the conference by Dr. John Rock.

The volume does not propose to acquaint the reader with a systematic review of diagnostic procedures, but will appeal to the experienced clinician. It affords a re-examination of a number of both accepted and debatable procedures utilized in appraising the fertility of the barren couple. The pages abound with many challenges for the investigator, and perhaps the greatest value of the book will be realized if research and clinical inquiry is stimulated by its publication.

A list of the Members of the Conference follows the Table of Contents, and a perusal of those who were in attendance attests to the high quality of the papers and discussions. Much credit is due Dr. Earl Engle, Chairman of Committee on Research, in organizing the conferences and editing the volume.

The book is an outstanding addition to the literature upon infertility and is a "must" for those interested in this aspect of medicine.

ROBERT S. HOTCHKISS.

RICE, THURMAN: *Sex, Marriage and Family.* Philadelphia, J. B. Lippincott, 1946, 272 pp. $2.50.

There can be no doubt that the author of this volume is deeply sincere in his endeavor to provide a practical guide, particularly for young people and especially for those newly returned to civilian life, to living within the institution of marriage. His attempt

to give forthright sex information and common sense suggestion regarding many of the realities of beginning homemaking will no doubt provide very necessary reassurance to many young couples embarking on marriage. Intertwined with scientific information, however, are numerous indications of a somewhat rigid moralistic attitude which, to this reviewer, detract measurably from the otherwise not inconsiderable value of the book. The present reviewer, at least, finds slightly antipathetic the author's application of the word "indulge" to sexual intercourse, with its connotation of a somewhat grudging concession to the weakness of the flesh; the reviewer is even reminded somehow of the undoubted fact that when the Goncourt brothers said, "Every woman should marry, but no man," they were saying more about the Goncourt brothers than they were about marriage.

Indeed, it must be said that from the psychiatrist's point of view, or from that of any one who deals with the complexities of human relationships, Dr. Rice is guilty of some degree of naiveté in his discussion, for example, of the causes of failure in marriage. We are told in his Preface that the problems incident to marriage can be solved successfully in most cases if these "are clearly understood by the young people themselves." Probably so; but Dr. Rice's contribution to this understanding still seems to the reviewer a rather incomplete one, even if valuable, as far as it goes, for its earnestness and sincerity. It seems regrettable that Dr. Rice has not applied his very real skill in writing for the average reader to producing a more profound and searching work—one having the merits without the defects of the recent book on much the same subject by Edmund Bergler, which, much more fundamental if at the same time narrower in its approach, is rather too difficult for the average reader. The present volume, per contra, deals, although often sensibly and helpfully enough, with for example, the more immediate and superficial rather than the deeper causes of failure in marriage. As such, it is successful enough in its rather too modest purpose.

HENRY ALDEN BUNKER.

LANDIS, CARNEY AND BOLLES, MARY M.: *Textbook of Abnormal Psychology*. New York, Macmillan, 1946, 588 pp. $4.50.

Current introductory texts in this field are focussing on the new psychodynamic principles and perspectives rather than the traditional data of the mental hospital. Such emphasis may be very desirable for students whose formal training in psychopathology will end with the single course in abnormal psychology. For students in the various professions dealing directly with disturbed persons, a first textbook should not consolidate viewpoints so early; the unsolved problems are too many to permit easy generalization of tentative hypotheses. Landis and Bolles offer a text for these more serious students.

The authors present a well balanced survey of the traditional syndromes of forensic psychiatry and of the recent physiologic, psychologic, and sociologic explanations. Rich research materials and methodologies are comfortably incorporated into the systematic discussions. Psychosomatic principles are neatly verbalized (p. 223) as well as trenchantly implied throughout.

Each syndrome is given a separate chapter, with its major symptoms, a case, its inner quality of "personal experience," and statistics of incidence and recovery. Historical attitudes to the disorder usually introduce the report and evaluation of current, conflicting theories of causation. The unsettled questions and research needs are pointed up sharply.

Recognizing that the clinical syndromes do not exhaust the data of psychopathology, the authors, in seven separate chapters, review the field in terms of the various functions: disorders of sensation, perception, action, speech, memory, emotion, will, and intellect. The "mental status" tradition is brought up to date. Again, valuable experimental, psychometric, and clinical data are given.

Other theoretical chapters elaborate the special viewpoints of genetics, biochemistry, neurology, cultural anthropology, and psychogenetics. The student is forced to recognize the serious lack of systematic therapeutic procedures for most of the behavior disorders. The final sections on the legal, mental-hygiene, and educational implications suggest our practical methods for personal and societal handling of abnormal behavior. The student is both reassured and yet given cautious advice. A ten-page glossary of terminology will also prove helpful.

Striking weaknesses are the exaggerated claim for EEG findings on epilepsy ("clearly corresponds . . . nine times out of ten" [p. 123]), and the unfortunate dichotomy of "psychogenic" versus "psychoanalytic" explanations (p. 165). And finally, there is serious error combining misunderstanding and misprint (p. 15): "Originally Freud divided consciousness . . . into the foreconscious, the subconscious, and the unconscious, meaning by these terms about the same thing they mean in everyday usage."

The text as a whole is very comprehensive; the instructor will be challenged to do justice to the many approaches and the varied research data. The student should be greatly stimulated.

JOEL SHOR.

SHERMAN, MANDEL: *Intelligence and Its Deviations*. New York, Ronald Press, 1945, 286 pp. $3.75.

The preface of this volume states that "The purpose of this work is to present theoretical, experimental, and clinical material on intelligence and its deviations. The subject is presented in such a way that it may be used in courses in departments of psychology and medicine . . . This book treats together the medical, psychological and social aspects of the subject and aims to correlate the essential data . . ." In this reviewer's opinion, the author did not succeed in this latter aim.

There is a smattering of "social" and somewhat more than a smattering of the "psychological" aspects in the volume, with an overemphasis on medical-neurologic aspects.

The book has fifteen chapters, five of which are entirely devoted to description of types of mental deficiency, one to the "adjustment of the defective" and two more (3 and 5) for the better part to problems of mental defect. Four of the five chapters present fairly clearly and concisely the usual material on mental deficiency. The chapter on epilepsy (if it belongs in this context at all) is most unsatisfactory. This may be due to the fact that the volume is based mostly on material published before 1940.

The "social" aspects get very little attention, and that little is mostly only in relation to delinquency and the vocational adjustment of the mental deficient. This is the more regrettable since the varieties of formal organization of intelligence in "neurotics" and "normals" of average as well as superior endowment has come to be of increasing importance in regard to social as well as vocational adjustment.

The psychologic treatment of the problem of intelligence is lacking in depth and information. Disregarding the factual weaknesses and errors of presentation one is struck by total disregard for much of the last twenty-five years of work in psychology bearing on our present understanding of intelligence: *e.g.*, the work of Piaget and Heinz Werner on developmental factors, of T. Abel on feeblemindedness, of Buehler and of Cattell on infant intelligence; all work on "scatter" analysis; the work of Shakow on schizophrenia, of Goldstein on brain injury, of K. Lewin's pupils (to mention only Kounin) on the feebleminded.

In defense of the author one might want to say that to write a comprehensive treatise in our days on intelligence is perhaps an insurmountably difficult job, even if one does not attempt to synthesize this material for use "in courses in departments of psychology *and* medicine." The function of intelligence is to a great part dependent on the organization of thought processes. A modern view of intelligence functioning therefore will have to cope with the relation of thought-organization to the functioning of the organism. The data we possess at present are insufficient to cope with the problem, yet we have sufficient material to map out the gross outlines of these relationships. Thought organization, personality organization, and modes of adaptation to environment are some of the links in the chain along which the data extant could yield a picture of intelligence compatible with present-day psychology.

To illustrate the gaps of the volume it should be mentioned that the question of the emotional aspects of the development of intelligence is not even touched upon.

DAVID RAPAPORT.

BOOKS RECEIVED

ABRAHAMSEN, DAVID: *The Mind and Death of a Genius.* New York, Columbia University Press, 1946, 228 pp. $3.00.

DAVISON, W. C.: *The Compleat Pediatrician.* Durham, Duke University Press, 1946, $3.75.

Handbook of Correctional Psychology. Edited by Robert M. Lindner and Robert V. Seliger. New York, Philosophical Library, 1947, 691 pp. $10.00.

KELLEY, DOUGLAS M.: *Twenty-Two Cells in Nuremberg.* New York, Greenberg, 1947, 245 pp. $3.00.

LANGDON, GRACE: *Home Guidance for Young Children.* Revised edition. New York, John Day, 1947, 368 pp. $4.00.

Medicine in the Changing Order. New York, Commonwealth Fund, 1947, 240 pp. $2.00.

MERRITT, H. H., METTLER, F. A., AND PUTNAM, T. J.: *Fundamentals of Clinical Neurology.* Philadelphia, Blakiston, 1947, 289 pp. $6.00.

Military Neuropsychiatry. Edited by the Associates for Research in Nervous and Mental Disease. Baltimore, Williams and Wilkins, 1946, 366 pp. $6.00.

The Philosophy of Insanity. New York, Greenberg, 1947, 116 pp. $2.50.

The Problem of Fertility. Edited by Earl T. Engle. Princeton, Princeton University Press, 1946, 262 pp. $3.75.

Progress in Neurology and Psychiatry. Edited by Ernest A. Spiegel. New York, Grune and Stratton, 1946, 708 pp. $8.00.

Psychiatric Interviews with Children. Edited by Helen L. Witmer. New York, Commonwealth Fund, 1946, 443 pp. $4.50.

RENDER, HELENA W.: *Nurse-Patient Relationships in Psychiatry.* New York, McGraw-Hill, 1947, 346 pp. $3.00.

RICHARDS, THOMAS W.: *Modern Clinical Psychology.* New York, McGraw-Hill, 1946, 342 pp. $4.50.

SOKOLOV, BORIS F.: *Jealousy; a Psychiatric Study.* New York, Howell, Soskin, 1947, 262 pp. $2.50.

WASSERSUG, JOSEPH D.: *Your Rheumatism and Backaches.* New York, W. Funk, 1947, 318 pp. $2.50.